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METHODOLOGICAL CONSIDERATIONS AND USE WEAR ANALYSIS OF THE LATE ARCHAIC SITES OF DUCK LAKE AND POPPER FROM GRAND ISLAND MICHIGAN

JAMES W. HILL III

110 Pages

This project analyzed use wear on 100 artifacts recovered from two Late Archaic sites located on Grand Island, Michigan, Duck Lake and Popper. I have divided my project into three phases. The first phase involved a simple presence/absence study of microwear on a sample of informal and formal tools from Grand Island. The goal of this phase was to create a replicable methodology and scoring method for the different types of wear identified in the Grand Island assemblage. The second phase involved several tasks. Initially, I reconstructed several tools from quartz, quartzite, and chert from Grand Island and then used these pieces to complete several tasks. I did planing and cutting activities on wet antler and hard antler to discover how antler processing affects and effects stone tools. Next, I butchered, gutted, and filleted a half dozen fish with expedient stone knives. These fish experiments varied from five to twenty minutes of use. This phase of the project examined how use accrues on stone tools. Although not exhaustive, it does provide a baseline for comparison of use and a steppingstone for the next phase of research. I was able to determine that stone tools accrue use starting at 5 minutes. Light polish begins to display at between 5-15 minutes, Medium polish displays 15-25 minutes, and heavy polish appears greater than 25 minutes. The third and final phase compared the use marks from my experimental section to the use marks on the artifacts to attempt to determine the activities these tools were used for and potentially how long they were used

In addition to these three phases, I created a scale of use for the intensity of polish formation on artifacts from Grand Island. In concert with polish formation, I determined that striations along the tool edge determined direction of use. Lateral striations to the blade edge signify lateral movement and perpendicular striations indicated a movement that has been used in a scraping or planing motion.

I have successfully compared two Late Archaic sites from Grand Island, Michigan. I created a use wear methodology for determination and scoring of use on quartz and quartzite expedient stone tools, and I have created a replicable methodology that can be utilized on all sites and all time periods. The study concluded, based on the methodology created, that there is a difference in the way the tools at Duck Lake and Popper were used.

KEYWORDS: Archaeology, Experimental, Grand Island, Microwear, Usewear

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ARCHAIC SITES OF DUCK LAKE AND POPPER FROM GRAND ISLAND MICHIGAN

JAMES W. HILL III

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

MASTER OF SCIENCE

Department of Sociology and Anthropology

ILLINOIS STATE UNIVERSITY

2021

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ARCHAIC SITES OF DUCK LAKE AND POPPER FROM GRAND ISLAND MICHIGAN

JAMES W. HILL III

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CHAPTER I: INTRODUCTION

The archaeology of hunter-gatherers is difficult. Hunter-gatherers are often mobile, have temporary housing, and often leave behind only minimal archaeological traces. This is especially true for the Archaic Period on the south shore of Lake Superior where few sites have been located and excavated intensively. The exception is on Grand Island, Michigan, where large Archaic Period sites have been located and excavated (Benchley et. al. 1988; Drake et al. 2009, Dunham 2009, Neubauer 2016,). These sites represent locations for the seasonal gathering of people in the spring, summer, and fall as different seasonal resources became available (Dunham 2013:5; Neubauer 2016). One of the long-standing goals of the Grand Island Archaeological Program (GIAP) was to explore new ways to examine the archaeology of the region (Hanson et. al. 2019, Skibo et. al. 2009, Malainey and Kooiman 2016, Skibo 2015, Drake et. al. 2009). It was in this spirit that this study focused on the Use wear of Archaic Period, and in particular quartz and quartzite, tools. Use wear analysis has never been conducted on the lithics of the region and there has been little success, worldwide, in identifying use-wear on quartzite. This study fills a much-needed gap in the literature in the Upper Peninsula as well as in the archaeological record.

Grand Island forms a naturally protected harbor that offers, on the south side of the island protection from the wind and waves of Lake Superior. The shallow waters in the Murray's Bay provide excellent habitat for spring and summer fishing (Dunham 2012, Schlanger 1992: 93). As Neubauer (2016) notes, persistent places such as Grand Island are locations where there is a high concentration of desirable resources including natural, cultural, and kin related resources. These natural and/or cultural features are essential in the structure, reuse, and maintenance of multi-component sites (Dunham 2012, Moore and Thompson 2012, Schlanger 1992).

Persistent places provide temporal continuity in an archaeological landscape where the sites are not contemporaneously occupied (Dunham 2012). In this thesis, I will discuss and analyze a sample of lithic tools from two persistent sites from Grand Island--Duck Lake and Popper. Coastal aggregation sites such as Duck Lake and Popper allow communal ties to the landscape to flourish, permitting transitory communities to gather, fish, and hunt. Storing for the lean times and bringing a sense of community and owning of space, are important components of these sites (Dunham 2012: 191-194).

At aggregation sites within the region, kinship ties are formed during these repeated forays into the waters and campsites on and around, in this case, Grand Island (Drake et. al. 2004). Kinship ties provide direct and indirect fitness benefits for the inhabitants utilizing the island. Reciprocity, according to Smith et al. (2016: 15), “is most likely to occur when individuals have repeated interactions that foster trust and a reputation for cooperating” (Smith et. al 2016: 15). The inhabitants of Grand Island needed to pool labor resources in order to effectively and efficiently harvest the resources on Grand Island that are vital to subsistence (Drake et. al. 2004, Smith 2016). Reciprocal exchange provided the smaller bands of hunter gatherers in the Upper Peninsula a surplus of food storage, a surplus of labor to harvest these resources, and an ability to foster kinship ties that help to buffer resource limitations and mitigate malady of the bands (Drake et. al. 2004, Kelly 2013, Smith et. al. 2016).

Grand Island Michigan is the largest island on the south shore of Lake Superior and is separated from the mainland by a 600-meter-wide deep-water lagoon (Anderton et. al. 2004). The island is 8 km wide and 13 km long with a total of 40 km of shoreline, and elevations from 183 m above sea level to 300 meters above sea level (Anderton et. al. 2004). The western side of the island is made up of a Precambrian/Cambrian red Jacobsville sandstone formation, which is

stratigraphically located above the Munising formation (Anderton et. al. 2004). A conglomerate between the Jacobsville and Munising formations houses the abundant quartz, quartzite, and chert cobbles that erode from the layer and wash ashore on Grand Island and provide the raw materials for stone tool making (Anderton et al. 2004).

Figure 1.1 Quartz and Quartzite cobbles that have eroded and deposited along the shore. Photo taken by the author

Figure 1.1 shows an area of Grand Island shoreline with cobbles that have eroded out of the geological formations listed below and washed up on shore. These stones were being heavily

utilized in lithic tool industry on Grand Island (Anderton et. al. 2004, Neubauer 2010, Neubauer 2013). Stratigraphically above the Munising Formation are the Chapel Rock Member and the Miner's Castle Member, both of which are white to grey sandstones that form the geological cap of Grand Island (Anderton et. al. 2004).

The most important variable in the settlement of the Upper Peninsula of Michigan is the Great Lakes themselves. Between the early and late Archaic, the Great Lake's high and low water level changes were so drastic that they entirely reshaped the landscape of the region (Lovis et. al. 2012). Glacial retreat between 13,000- 12,700 B.P. caused the lake levels to rise. Further complicating the archaeology of the region, the re-advance of glaciers during the Marquette advance, which lasted until 11,400 B.P. resulted in the destruction of the previously existing shoreline (Anderton et. al. 2004). The current geomorphology of the region does display the shoreline of the Marquette advance, which was used as a shoreline to build campsites by inhabitants of the region (Anderton et. al. 2004). It is important to note the existence of these shorelines as they can serve as predictive models for potential sites, such as the 2009 study by Anderton that resulted in a predictive model for sites in the Pictured Rocks National Lake Shore, directly across the harbor from Grand Island (Anderton et. al. 2004, Anderton et. al. 2009). The shorelines can serve as rough guide for finding sites, which is especially important within a region such as the U.P. that has poor preservation (Anderton et. al. 2004).

During the Early Archaic, around 10,000 B.P., the lake level in Lake Superior shrank to a height at 42.6 meters above sea level exposing large areas now underwater in what are Michigan, Ontario, Ohio, Illinois, and Indiana (Lovis et. al. 2012). During the Nipissing high water phase, where Lake Superior water levels rose to 192 meters. Flooding the shoreline sites in the region from the Early to Middle Archaic, this change in lake size created a new environment

(Lovis et. al. 2012). Flooding brought the water resources closer to the inland hunting resources and compressed the population into an area that is roughly half the previous size. The dramatic lake level changes occurred by 4,500 B.P. (Lovis et. al. 2012). The shorelines within the Lake Superior region have always been in a state of flux vastly changing the landscape within the region (Anderton et. al. 2004, Lovis et. al. 2012). Figure 1.2 is a chart that portrays the lake level phases within the Lake Superior region.

Lake Phase:	Cal. B.P.	Geomorphic Evidence
Post-Duluth	11,200-11,100	Unclear; High scarps ranging from 225 to 420 meters may reflect retreat of Au Train Formation capstone rather than shorelines.
Minong	10,700	Unclear, may have been obscured by the Nipissing shoreline.
Houghton	8900	Submerged remains of forest at 60 meters depth on floor of east channel. Gully system etched into upland above 192 meters.
Nipissing I	5400	Prominent Wave-cut shoreline at about 192 meters encircling much of the island. Island separated into three lobes.
Nipissing II	4450	Extensive depositional coastal landforms between about 186 to 192 meters, including the Williams Landing Spit, Duck Lake Cuspate Barrier, Muskrat Point Cuspate Barrier, and others.
Post-Nipissing to Modern	Post 4450	Beach ridge complex/Tombolo between east and west lobes of island below 186 meters. Flooding of lowest beach ridges at head of Murray Bay due to post 1400-1200 B.P. transgression.

Figure 1.2 Lake phases and associated geomorphic evidence from Grand Island. Adapted from Anderton et. al. 2004 page 117

Another challenge of Upper Great Lake archaeology, particularly during the Archaic Period, is the lack of formal lithic tools. A number of researchers (Anderton 2004; Benchely et. al. 1988; Drake et al. 2004; Neubauer 2016) have made the case that the lithic tool assemblages

from Archaic sites are dominated by an expedient flake tool technology. It is argued that seasonal visitors to the island took advantage of the locally available quartzite to fashion expedient flake cutting and scraping tools. The large flakes found at these sites are effective cutting tools, but it is often difficult to determine utilization on quartz and quartzite with the naked eye. Use wear analysis, therefore, is an effective way to both confirm the utilization of these flake tools and to explore the possibility of making more precise inferences about flake tool use. Use wear analysis on quartzite, however, is difficult, labor intensive, and challenging to interpret (Keeley 1980, Knutsson et. al. 2015).

This study is the first microscopic analysis of stone tools from Grand Island. I have assessed 100 flaked stone tools from the Late Archaic sites of Duck Lake and Popper. The goals of this study are to:

1. Create an effective methodology and scoring method for non chert lithic resources on Grand Island. Use-wear analysis on non chert lithics is not common, so a methodology needed to be developed in order to study this collection.
2. Determine if the tools were used. Once a methodology for analysis is established it can be applied to the Grand Island tools to examine if the tools were used.
3. Explore whether duration of use can be determined. The majority of these tools are expedient direct percussion or bipolar flakes, so understanding the tasks completed with these expedient tools is necessary to gather a complete reconstruction of tool use including sharpening and retouch episodes on both the tools themselves and the corresponding retouch flakes.
4. Investigate the type of material processed with these tools and if directionality of use can be determined.

5. Compare Duck Lake and Popper tool use-wear. The lithics from these nearby, roughly contemporary sites were recently examined by Neubauer (2016), which provided a foundation for making functional inferences about tool use. The primary goal of Neubauer's dissertation was to provide site reports for Duck Lake and Popper as well as determine a methodology for determining the activities that created fire-cracked rock (FCR). Neubauer also identified the tools and organized the collection based on type, size, and whether it was retouched along with a number of other variables. Her analysis provides an excellent baseline for my study as she inferred the use of tools based on shape and retouch. My study will build upon Neubauer's functional analysis through the investigation of use-wear.

Site summaries duck lake and popper

Duck Lake (FS 09-10-03-1056)

The Duck Lake site is located on the Duck Lake Cuspate Barrier (Anderton et. al. 2004, Neubauer 2016). During the Nipissing Phase flood waters got trapped within a triangular sand dune complex, thus forming the present Duck Lake (Anderton et. al. 2004, Neubauer 2016). The site ranges in elevation from 186-192 amsl and extends for about a quarter mile along a relic beach ridge. The estimated size of the site is 150,000 square meters (Neubauer 2016). The Duck Lake site sits on the Nipissing shoreline and was available for habitation for almost a thousand years when a shallow open waterway existed between the island's main portion and the "thumb" (Anderton et. al. 2004).

The Duck Lake site was discovered by the Grand Island Archaeological Program (GIAP) in 2008 through systematic shovel testing along the Nipissing shoreline. The following summer GIAP returned to the Duck Lake site and excavated six 2x2 meter units and a single 1x1 meter unit (Neubauer 2016). Each unit was excavated by arbitrary 5 cm levels and all artifacts were

piece-plotted (Neubauer 2016). A single hearth feature was identified. A five-liter soil sample was taken from the feature along with charcoal, which yielded a radiocarbon date of 3610 $\pm$ 30 B.P. (Neubauer 2016:161).

A total of 18,552 lithics were recovered from the 2009 GIAP excavation of Duck Lake. (Neubauer 2016: 162). The Duck Lake lithic assemblage is broken down as thus: 83% of the assemblage is Fire Cracked Rock (FCR), 16.5% chipped stone, and 0.5% rocks and ground stone tools (Neubauer 2016:253). The chipped stone numbers 3,007 flakes, 3 quartzite uniface preforms, and 55 cores (Neubauer 2016:254). The majority of the chipped stone was locally available quartzite cobbles: 2,240 artifacts were made of quartzite, 808 artifacts were identified as quartz, and chert artifacts number only 20 (Neubauer 2016:254-255). A total of 72% of the flakes were produced through direct percussion and 28% were bipolarly knapped (Neubauer 2016: 255). Neubauer also found that quartz and quartzite tools were also made differently. A total of 86% of the quartzite flakes were direct percussion flakes and 14% of the flakes were bipolar, whereas the quartz assemblage is 62% bipolar and 38% direct percussion (Neubauer 2016:255)

Based on Neubauer's (2016) analysis, 99 lithics had macroscopic signs of use, retouch, or both (Neubauer 2016: 256). Neubauer concluded that the chipped stone tools within the Duck Lake assemblage are part of an expedient technology without special care made in the formation of these tools. I selected 70 artifacts of chipped stone from the Duck Lake site to be analyzed microscopically.

The artifacts were selected based on several criteria. The first set of artifacts were selected because they were identified in the Neubauer dissertation as having macroscopic retouch and utilization. The next group of artifacts was selected because they had a similar morphology

to the tools macroscopically identified as having been utilized (Neubauer 2016). These artifacts were longer in length, thin along the edge, and had a large ventral surface. The last group of artifacts are identified as retouched flakes. These retouched flakes were selected to test if tools were used and then rejuvenated.

Popper (FS-09-10-03-825/ 20AR350)

The Popper site is located within a Nipissing beach ridge complex at the south end of the island. (Anderton 2004, Neubauer 2016). This is a multi-component site with artifacts ranging in age from the Late Archaic to the Woodland period (Neubauer 2016). The site sits 192 m above sea level on the backside of beach ridge that would have been available for habitation after 4,700 B.P. (Dunham et. al. 1999, Neubauer 2016). Multiple field seasons have been spent at the Popper site, producing three C14 dates: 1,230 +/- 350 B.P. (Anderton 1993), 4,260 +/-50 B.P., and 4,100 +/- 60 B.P. (Dunham et. al. 1995, Neubauer 2016:217). The first date is from the Woodland component and the last within the Late Archaic date range (Neubauer 2016:217). I will focus on the GIAP material excavated at Popper in 2007 in the region of the site dominated by Late Archaic material.

From the 2007 excavations at Popper a total of 10,362 artifacts were collected and attributed to the precolonial use of Grand Island (Neubauer 2016:217). Of these artifacts, 9,800 are lithics and associated with the Late Archaic use of the site (Neubauer 2016:217). Popper is a unique site because unlike other sites on Grand Island, Popper is not dominated by FCR; in fact, 68% of the artifacts are chipped stone, 23% FCR, and 9% rocks and ground stones (Neubauer 2016: 218). The chipped stone that was collected from Popper was dominated by quartzite (84.7%), which follows the pattern for Late Archaic sites on Grand Island discussed by Drake et al. (2009). A total of 14.9% of the material was quartz, and 0.4% chert (Neubauer 2016:218).

Direct percussion flaking was the knapping method preferred in 86% of the chipped stone and bipolar reduction only produced 14% of the total chipped stone assemblage (Neubauer 2016:219). Chert and quartzite were knapped using predominately a direct percussion reduction method with 94% of those materials knapped directly and 6% bipolarly (Neubauer 2016:219). Quartz was knapped differently with 56% of the material knapped bipolarly and 44% knapped via direct percussion. Once again, the preeminent technological choices in regards to knapping were expedient, creating informal tools (Neubauer 2016:223).

I have selected 30 artifacts to study from the Popper site. This raised the total number of tools to be analyzed by the study to 100 artifacts. The goal in selecting artifacts from both sites was to test my methodology for scoring use wear on prehistoric stone tools from the Duck Lake and Popper sites. I selected artifacts from Popper much the same way that I selected artifacts from Duck Lake. The first group of artifacts selected were the artifacts that were identified macroscopically as having been utilized or retouched. The next group of artifacts was then selected because they morphologically are similar to the artifacts previously identified as tools. In addition, several retouched flakes were assessed. There is a fourth group of artifacts that were analyzed that were not present at Duck Lake. This group consists of four bifaces made of chert. Three of these bifaces were analyzed. The fourth biface was represented by a broken portion of a base and not subjected to use wear analysis.

CHAPTER II: USE WEAR HISTORY, GOALS, AND SUBJECT DIVERSITY

“The main goal and general purpose of microwear studies as to reconstruct, as completely as possible, the primary economic activities of prehistoric groups” (Keeley 1974:323).

The study of microwear was standardized for the first time by Sergei Semenov in his 1957 work, *Prehistoric Technology*. After release of the English translation in 1964, a flurry of research followed in the United States and Europe. The seminal work for American microwear archaeologists lies in the 1980 publication of *Experimental Determination of Stone Tool Uses* by Lawrence Keeley. In this work, Keeley discussed the broader goals of microwear and how to properly analyze materials within a use wear study.

Keeley outlined the principles that every use wear study should adhere to, which included that microwear results should be compared to an experimental regimen that is specific to the material being studied and the sites temporal range (Aranda et. al. 2012, Bamforth 2010, Keeley 1980: 9, Knutsson 2015).

While there is a paucity of use wear studies of quartz and quartzite in comparison to chert, several scholars have investigated these materials. Aranda et al (2012:46) state that comparing the use wear traces from flint and quartzite are largely ineffective because of the differences in the heterogeneous nature of the two materials. Due to this material difference, comparisons between the materials is not useful. Therefore, it is necessary to produce an experimental collection of quartzite tools with known uses to compare more accurately with the material from the archaeological record. Within this pilot study, the experimenters assessed an experimental collection of eight artifacts, four were used for butchering activities and the final four were utilized for woodworking (Aranda et. al. 2012: 46). Experimenters studied artifacts that were created from local resources and then use was recorded at several different intervals

when the experimenter was switching use style within the activities (Aranda et. al. 2012: 47). By sequential study of the experimental artifacts, the analysts were able to determine what movements created what signs of wear as well as determining how different traces of use wear interact together (Aranda et. al. 2012: 47). Similarly, Knutsson et al. (2015: 522) relied on experiments to determine how tool use variation appeared differently on quartz artifacts at sites in Northern Europe (2015: 522).

Keeley argues that in order to determine the differences between signs of use, an experimental program must be completed in order to determine the potential economic activities within a site and an individual resource (Keeley 1980: 83). Bamforth suggests that through an extensive experimental regimen, the experimenter can create a collection of stone tools that is specific enough to determine the differences within the same types of activities (Bamforth 2010: 99). For example, an artifact can be identified as being utilized on meat cutting. Bamforth (2010:99) argues that through experimental study he can determine if the tool was utilized on specific types of meat, such as the difference between salmon and bison. In short, these studies demonstrate that an intensive study of experimental collections can determine the direction of tool use (Aranda et. al. 2012:47), the type of material worked (Knutsson et. al. 2015) and provide the basis for comparing technical behaviors at the inter-site scale of analysis (Keeley 1980:83).

Another core principle developed by Keely that is still widely employed (e.g., Aranda et. al. 2012, Conte et. al 2015, Keeley 1980:9, Liu et. al 2016, Sussman 1985), is the exploration of how use accrues over time on the experimental piece. Aranda et al. (2012) discovered that some activities distort, disturb, and camouflage signs of use. In addition, they state that there is a loss of traces of wear on heterogeneous materials over time as the tool atrophies, destroying signs of use (Aranda et. al. 2012: 46).

Focusing on quartz, Conte et al. (2015:62) provide a history of non-flint use wear and argue for a study to determine use over time in order to determine what signs of wear appear on the material from post depositional causes and what signs of wear are actually use-wear (Conte et. al. 2015:62). Keeley argues for time stamped experimental tools to determine the differences in the polishes in terms of brightness, texture, size, and disruption of the microstratigraphy of the tool (Keeley 1980: 63-75). Following this line of reason, Ji-Ying Liu et al. (2016) stopped every three minutes in their experimental regimen to assess macroscopic and microscopic edge damage over time. This provided insight into how pressure, movement type, and material worked affects/distorts the signs of use in quartzite (Liu et. al. 2016: 509).

Sussman (1985: 107) studied how use accrues over time on quartz and flint from Colorado. By assessing the experimental tools at 1 minute, 5 minutes, 10 minutes, 20 minutes, and 60 minutes she was able to determine artifact change over time, how resharpening affected the signs of use, what types of use distorted other signs of use, and at what times the changes on the artifact occurred. Variability of use wear signs over time is essential in answering the question as to how long an artifact is utilized.

Keeley also makes the important point that experiments should be actualistic in nature (see Aranda et. al. 2012, Keeley 1980:9, Knutsson 2015, Lerner et. al 2007). For example, Aranda and company's purpose is to create Achuelean hand axes from local resources and then see how woodworking activities and butchering activities appear over time (Aranda et. al. 2012: 46). The choices of activities were limited to specific butchering activities that had been previously observed in the faunal assemblage of the site (Aranda et. al. 2012: 46). During Keeley's experimental activities he processed organics, wood, and animal remains that would have been processed by the site's inhabitants. The Knutssons examined how wood, fresh hide,

meat, vegetables, tanned hide, as well as antler, bone, charred wood, and shell affected the microstratigraphy of quartz expedient flake tools (Knutsson et. al. 2015: 520).

Lerner et al. (2007) took a more formal, quantitative approach to experimentation on stone tools. They took a diamond tip indenter and tested how each of four different materials responded to six different pressures that were applied in both a point pressure technique as well as scraped across the edge of the experimental tool (Lerner et. al. 2007:714-715). This test was utilized to determine the role that pressure plays in the formation of use wear. According to Keeley, once the experimentation is accomplished, all forms of wear both on the experimental assemblage and the archaeological assemblage need to be assessed fully to best understand and to quantify the results of the microscopic analysis as in depth as possible. “To achieve success microwear must explain the functions and uses of the tools examined, strive to understand how the individual artifact fits the standard of the unit, site, and the region” (Keeley 1980:1).

Because the majority of tools from Grand Island are made of locally available quartz and quartzite, I will focus the following section on microwear study of quartz and quartzite. To successfully complete a use wear analysis an analyst must be able to determine the use areas of a tool, or conversely the lack of a use area on a tool (Bamforth 2010: 97). The determination of a utilized edge depends largely upon the medium being studied; on a heterogeneous material such as quartz or quartzite it is difficult to determine use areas (Knutsson et. al. 2015). A heterogeneous material is “...formed by a generally micro or cryptocrystalline matrix of variable composition and crystals included within that matrix... in the case of heterogeneous materials, matrix and crystals react differently and in consequence microscopic use wear analysis should focus on different criteria from those used to analyze homogeneous raw materials” (Conte et. al 2015). Use wear on quartz and quartzite includes rounding of the edges on the utilized surface,

brittle fracture, and non-uniform polish due to the heterogeneous nature of the material (Knutsson et. al. 2015, Lerner et. al. 2007, Sussman 1985).

The analyst must determine how the tool was utilized, such as by butchering, cutting, drilling, or scraping. In the case of quartz, the most complete and visible polishes appear to have been created by contact with wood, bone, plant remains, and antlers (Conte et. al 2014: 61, Keely 1980). Edge rounding is largely attributed to the dry scraping of hides or other similarly lengthy tasks that require a repetitive movement (Conte et. al. 2014: 61). Striations similarly appear in tools that have been utilized in working heavy thick organic objects such as bone, wood, and antler, though heavy edge fracturing is also common in these activities (Conte, et al. 2014:61, Hardy et. al. 1998, Sussman 1985).

Concurrently, the analyst must identify the general hardness of the material that the tool was used to work (Bamforth 2010: 97). As previously mentioned, the hardness of the material worked can be determined based on the sheen or gloss that appears on the object combined with the overall dullness of the blade edge (Conte, et. al. 2014: 61, Knutsson 2015, Stemp et. al. 2010). The more evidence for material fatigue (that is to say the dullness of the blade edge past its prime usefulness point), the greater the frequency of use and the denser the material (Conte. et al. 2014:61, Lerner et. al. 2007, Stemp et. al 2010, Sussman 1985).

Lastly, the analyst must identify the specific kinds of contact material paired with a use action. For example, scaling fish may give a different microwear pattern than gutting fish (Knutsson 2015). This also includes any material that could have come in contact with the tool via hafting, graving activities, drilling acts, projection, and piercing actions (Bamforth 2014:98). On quartz and quartzite this will look like a rubbed or worn edge that has otherwise been unmodified compared to the rest of the tool (Conte et. al. 2015, Knutsson 2015). It is important

to realize that this may not appear on expedient tools, as these are more than likely one-time use items (Andrefsky 1994, Binford 1979, Keeley 1980, Knutsson 2015). By mixing low and high-level magnification microscopy, the analyst can best determine the edge damage, striations, and polishes associated with tool utilization (Andrefsky 2008, Bamforth 2014: 95, Conte et. al. 2014, Grace et. al. 1985, Hardy et. al. 1998, Knutsson 2015, Stemp et. al. 2010, Sussman 1985,).

The lack of formal tools within the assemblage places a limitation on collections that have more expedient tools rather than formalized tools due to the apparent length of time associated with the use of both tool categories; expedient tools are expected to be utilized less intensively and therefore may not accumulate distinctive signs of use (Andrefsky 1994, Knutsson 2015). Expedient tools are those tools that are created for a specific purpose and are discarded once that purpose is fulfilled whereas formalized tools are often created for more generic purposes (Andrefsky 1994, 2010). Because formal tools are curated, these tools show the most wear. These types of tools include bifaces, flake tools (non-bifacial tools that have been edge modified or utilized in some capacity), and cores (the blocky piece of raw lithic material from which flakes are produced) (Andrefsky 2010:81). Another factor that plays into the creation of expedient tools is the availability and ease of access to the materials being worked (See figure 2.1) (Andrefsky 1994, 2010).

The abundance of lithic resources on Grand Island likely contributed to the reliance on expedient tool technology. These lithic resources erode from the conglomerate that rests between the Jacobsville and Munising geological formations of the island itself and are exposed on the beaches of the Grand Island within easy reach of the inhabitants of the island (Figure 2.1). (Anderton 2004; Drake et al. 2009).

Figure 2.1 Mather Beach on the west side of the island with quartz and quartzite cobbles in view (photograph by author).

As previously stated, quartz and quartzite have a very grainy texture and are considered to be heterogenous (Sussman 1985). The main drawbacks to implementing a use wear study on quartz and quartzite are due to the microtopography that is very jagged and broken, the inconsistent way the material fractures while knapped, its ability to reflect and refract direct light from the microscope, and its overall hardness. All of these factors prove to make it difficult to analyze and experiment with these lithic resources (Knutsson 2015, Sussman 1985). The grainy nature of the material will distort polish, striations, and produce edges that are dulled beyond their actual use (Grace 1990, Knutsson 2015, Sussman 1985).

Despite these drawbacks, I was successfully able to accomplish the use wear goals stated in the first chapter. I completed a use wear study on locally available quartz and quartzite expedient tools using a methodology that is unique to the Grand Island lithic materials and sites. During this investigation, a new scoring method was created in order to assist in the explanation of the signs of use and the methodology was perfected. I will now discuss the methodology and the scoring method for use wear study that was completed on Grand Island material.

CHAPTER III: METHODOLOGY AND SCORING FOR LITHIC USE WEAR ANALYSIS

The primary issue with analyzing expedient tools made of heterogeneous materials is determining how these “tools” differ from the debitage of the site (Knutsson et. al. 2015:517). The first challenge is to better identify what is a tool and what is simply debitage (Knutsson et. al. 2015:517). Based on Neubauer’s (2016) analysis, I selected three sets of artifacts from Duck Lake and Popper for microwear analysis, with the goal of selecting artifacts that provided the greatest chance of utilization. As the primary goal of this study was to establish the presence or absence of use on artifacts, this was the most prudent course of action. This selection of artifacts was determined based on three criteria. The first set selected included a portion of the tools that were previously identified as having edge reworking and utilization (Neubauer 2016).

The second and third sets included artifacts that matched the morphology of utilized flakes but did not exhibit macroscopically visible edge damage. These artifacts were selected because they had what appeared to be a useful edge and similar morphology to the other artifacts previously identified as tools. The last set of artifacts (16) were selected because they matched the morphological description of retouch flakes, and I wanted to see if the retouch flakes themselves appeared in the assemblage. The goal in selecting the potential retouch flakes was to provide another proven type of artifact to determine tool use.

Once the flakes were selected, they were digitally scanned. These scanned pictures were used during the analysis to take notes and mark areas with spots of use. The artifacts were then placed within an ultrasonic washer for ten minutes in *Mr. Clean* antibacterial liquid soap, to remove any soil or modern residue on the artifacts. This washing methodology is adapted from an outline for washing in Keeley (1980: 10-12). After the bath in the liquid soap, the artifacts were washed for ten minutes in the ultrasonic washer to remove any trace of the cleaning liquid.

Once washed the artifacts could no longer be touched by hand as oils from the skin can distort signs of Use wear (Keeley 1980: 10-12).

The artifacts were situated under the microscope using modeling clay to support the artifact without impeding the view from the microscope. All the microscopic analysis was done on an Olympus model BMH incident microscope that has magnification ranges from 50x magnification to 500x magnification. (e.g., Keeley 1980), I found lower-level magnifications to be the most efficient and beneficial. (Miller 2014)

I have chosen the low power microscopy (50-100x) for several reasons. In a 2016 microwear study Berruti et. al. (2016:117) utilized a metallurgical microscope in a low-level microscopic study of quartz and quartzite tools from the Paleolithic site of *Foz Do Enxarrique*. They found that, “in quartzite tools, use traces are very localized, appearing on the face of a single quartz crystal, on small clusters of crystals, and on small patches of silica matrix” (Barruti et. al. 2016:117). The low-level microscopic approach allowed the analyst to have access to a larger area of the tool in a single viewing pane without losing the individual crystals that are necessary for use wear on heterogeneous materials (Barruti et. al. 2016:117, Knutsson 2015:519, Miller 2014).

After a good deal of experimentation with the background light and magnification, it was found that a dark field light with polarization lenses helped redirect the light from the microscope so the materials did not reflect or refract the overhead light as much (Barutti et. al. 2016: 117, Miller 2014). Because quartz and quartzite are so reflective, using the darker light and polarization lenses reduced reflection and made examination of the edges possible (Barutti et. al. 2016: 117, Conte et. al. 2015: 62, Lerner et. al. 2007: 716). Despite this adjustment, the

microstratigraphy was difficult to focus on, especially when viewed from above because the stone had a rough texture. In order to resolve this problem, the analyst must focus through the image from one side to another. This allows the entire view from the scope to be in focus, but not at once. The Extended Focus Imaging on the Olympus Stream software package allows the analyst to stitch together a photo as they are being focused, allowing for a full in focus view of what is being displayed under the scope (Miller 2014). Once the scope settings were established, a scoring method was necessary to categorize the signs of use that I was seeing in the scope.

I have developed several scoring criteria to better measure how long a flake had been utilized. Polish is one of the most common types of wear that occurs on this assemblage and is a cornerstone for all microscopic analysis of stone tools. “Microwear polishes are small alterations of the material surface caused by the combined forces of movement, friction, heat, hardness, water, PH, and chemistry along the edge of the tool where work is concentrated” (Kimball et. al. 1995:8). I observed three levels of polish on these flakes: light, medium, and heavy polish. It is presumed that the different levels of polish are linked to relative lengths of time that an individual tool has been used as well as being unique to a certain medium that is being processed (Aranda et. al. 2012: 52, Grace et. al. 1985: 113-114, Liu et. al. 2016:507).

For the purposes of this study, I have defined light polish as: flakes that do not have expansive amounts of polish, the microstratigraphy can be clearly seen through the polish (that is there is no steamrolling of the micro flake scars and their lines of percussion), and the tops of the microstratigraphy are largely still intact without heavy modifications to the tops of the flake scars.

Figure 3.1 Light polish accrual circled in red. (All photos shot at 50 x magnification and measures at 200 microns across the image.)

As seen in Figure 3.1, the microstratigraphy of the flake is still largely intact, all of the micro flake scars are still visible, and no steamrolling of the tops of the microstratigraphy has occurred. The individual crystal itself (circled in red) has not been altered from its original shape. There is no rounding of the edges, no flattening of the surface of the microtopography, and the depth between the high points of the topography and the low points of the valleys is still relatively far apart.

Medium polish accrual occurs on flakes that have moderate amounts of polish; there is starting to be consistent formations of polish, the microstratigraphy has started to be covered up/destroyed by the polish, and the tops of the microstratigraphy have started to roll over and be disturbed (Figure 3.2).

Figure 3.2 Medium Polish Accrual

The microstratigraphy is starting to round off on the tops of the high points within Figure 3.2. Additionally, the microflake scars start to look more homogeneous and smoothed over, meaning that the micro stress fractures from the knapping incident are beginning to be distorted and steamrolled over to form a more complete polish. The actual crystal itself is starting to be rounded off and the flattened.

Heavy polish accrual occurs on flakes that have extensive amounts of polish in terms of length across the artifact edge or portion of the flake, the microstratigraphy is completely covered including flake scars, and the rolling over of the tops of the microstratigraphy is

consistently apparent. This will also lead to polish accrual in the valleys between the high points on the microstratigraphy.

Figure 3.3 Heavy Polish Accrual

Striations are another important use wear trace. These are cuts that run parallel to the blade edge or perpendicular to the blade edge and are a direct result of the directional use of the tool. As Conte et al. (2015: 66) note, striations are scratches “positioned parallel to the edge in longitudinal cutting actions and oblique or perpendicular to the edge in transversal actions”. The direction of striations relative to the working edge and how consistent they are across the artifact edge or the use area of the flake are important variables to identify. A flake that has lateral striations has been interpreted as being a flake that was utilized in a cutting motion consistent with meat cutting experiments. A flake that has perpendicular striations to the blade edge has been interpreted as being a scraper or utilized in a scrapping motion (Knutsson et. al. 2015:523).

Figure 3.4 Lateral Striations

Figure 3.4 contains lateral striations from one of the most heavily utilized flakes. The depth, length and consistent nature of these scratches is such that this flake was utilized quite extensively in a lateral motion.

Perpendicular striations appear at roughly a ninety-degree angle going out from the blade edge and are interpreted as reflecting use in a scraping motion. These striations go against the grain of the material and cross in a perpendicular motion through the microstratigraphy, whereas lateral striations move in a lateral motion to the blade edge and cross through the stratigraphy (Knutsson et. al. 2015:523).

Figure 3.5 Perpendicular Striations

As seen in Figure 3.5, the perpendicular striations are clustered together, cut through multiple parts of the microstratigraphy, and are consistent in their depth, thickness, and length.

Edge attrition appears microscopically as micro flakes taken out of the edge, polish forming along the edge, as well as the tops of the topography are ground down by the contact material.

Figure 3.6 Example of no edge wear

There are significant amounts of wear in figure 3.6 in forms of polish and striations, but the edge has minimal damage and does not have any edgewear. Figures 3.6 and 3.7 illustrate a tool that does not have significant edge damage (Figure 3.6) and a tool that does show significant edge damage (Figure 3.7)

Figure 3.7 Example of significant edge wear highlighted in red.

Note the jaggedness of the edge, the rolling back of some of the topography, and the micro flakes missing from along the blade edge. This tool features an edge that shows multiple signs of utilization.

Experimental regimen

The experimental collection was created with the goal of determining the length of time that a tool was roughly utilized and to determine the relationship between tool use, use accrual over time, and medium worked. I have assessed fifteen experimental tools made from materials from Grand Island. These flakes were knapped by hard hammer percussion. Five flakes were utilized to skin, fillet, and process catfish. Five flakes were utilized to scrape and cut dry antler

and five flakes were used to scrape and cut wet antler. The flakes were used in a task specific fashion with the goal to see how use accrues over time and at what point use first starts to appear on a tool. The above mediums were selected by the author as mediums that once paired with activity would provide use wear. Allowing for a test of edge damage over time. Figure 3.8 is a comparison of the edge damage and the polish accrual on three of the test flakes that were used to process several catfish.

Figure 3.8 Edge damage and polish accrual over time. 1.) Heavy polish and significant edge damage formed at 20:25. 2.) Medium polish formed at 11:30 minutes with moderate edge damage. 3) Light Polish with no noticeable edge wear at 5 minutes.

As seen in Figure 3.8, edge damage increased with increased use. Photograph #3 in Figure 3.8 shows a tool that was used for five minutes to fillet fish. Use wear lightly accrued on the surface but it still discernable. In Photograph #2 we see more expanded polish that has moved from the high points of the topography into the valleys (see Figure 3.8). The polish has started to steam roll over the micro flake scars and the tops of the microtopgraphy. Edge damage in Photograph #1 is much more extensive than the damage in Photograph #3. The tool shown in Photograph #1 displays the most wear and is the most utilized of the flakes from my

experimental collection with respect to fish processing (see Figure 3.8). This flake was utilized for 20-25 minutes and shows significant edge wear and medium polish accrual along the blade. There is one faint striation that appears on flake #2, but other than one striation on a high point, these tools were not striated. The lack of striations produced in meat production has been noted in other experiments (Conte et. al. 2015, Knutsson 1988, Knutsson et. al. 2015, Lerner et. al. 2007).

Knutsson et al. (2015) state that heavy organic materials produce the best polishes because meat polishes adhere to and fill in the microstratigraphy. On the other hand, heavy organics like bone, antler, and wood plow over and flatten the microstratigraphy. This is certainly true in my experiments with dry antler. For comparative purposes, I used two flakes to work dry antler using a cutting motion, two to scrape the antler, and one flake in a planing motion across the surface of the antler (Figure 3.9)

Figure 3.9 Polish accrual and edge damage to four experimental flakes utilized on Antler. 1.) Heavy polish, flattening of the topography, and lateral striations after 15 min of cutting. 2.) Significant edge damage, heavy polish, flattening of the topography, and lateral striations in 15 of scraping. 3.) Heavy Polish, sporadic pocking, moderate

edge wear, and lateral striations in 10 mins of dry antler cutting. 4.) Heavy polish, light flattening of the topography in 10 minutes of planing.

Figure 3.9 illustrates the importance of the activity and the material being worked in terms of use wear development. In comparison to Figure 3.8, the topography is highlighted by the polish and in Figure 3.9 the topography of the material is flattened by the polish. There is significant evidence of consistent polish and excessive edge damage while Figure 3.9 also highlights the choppiness of the edge damage. Micro flakes are being taken off the utilized edge and striations are running through the topography of the blade edges. Additionally, in Figure 3.9 the striations are deep and long, while in Figure 3.8 there are no striations present except for one example within the fish assemblage. This regimen provides the basis for understanding use accrual overtime in the chosen assemblage.

CHAPTER IV: USE WEAR ANALYSIS

Using the methodology and the experimental regimen described in the previous chapter, I analyzed the materials from the Duck Lake and Popper sites. Based on the analysis of use wear, I found that most of the artifacts identified as tools by Neubauer (2016) were indeed utilized. This addresses my primary research goal, which was to create a use wear methodology to distinguish tools from debitage. The Late Archaic tools from Grand Island are largely informal tools that are expedient and not curated for long periods of time (Marcucci 1988; Neubeaur 2016). Despite the drawbacks to doing a use wear analysis on collections of tools that are expedient and informal, I was able to identify signs of use on these flakes. I do not think that the tools from the sites are heavily curated (see Chapter One for more detail). Instead, they are being utilized for a long enough time to necessitate a sharpening episode and then reused and discarded. The individual results for Duck Lake and Popper are discussed below.

In this chapter I focus on the general use wear patterns. For the full results of the study please see Appendices A&B where I discuss the individual artifacts and have quantified the results from my use wear study. I discuss the Duck Lake assemblage first as most artifacts analyzed come from this site.

Duck Lake

The first step in doing a use wear analysis is to determine what areas have use and what areas do not (Knutsson et. al. 2015: 520). Of the artifacts identified using the naked eye (n=70) by Neubauer (2016), 94.2% had evidence of microscopic use-wear (Figure 5.1). I was not able to identify use-wear on only four flakes. The high rate of flakes from the sample that were utilized is due to the fact that I selected artifacts that were already identified as tools, those that fit the

morphological characteristics of those tools previously identified, and small retouch flakes that should show significant wear on the dorsal surface (flakes that were created in a resharpening episode being more likely to be used). The study was biased toward artifacts that would most likely have wear, those identified by Neubauer in her 2016 study and those with similar morphology that I identified, and this accounts for the high percentage of wear in the study. Confirming that these tools were used is a significant finding with this material. In selecting artifacts that had already been macroscopically identified as tools a significant amount of time was saved in the microscopic analysis of the materials and reaffirms the identification by Neubauer in 2016.

Evidence of use wear is most often on the ventral flake surface (Figure 4.1). Roughly 73% of the flakes show evidence of use on the ventral service. The reason for the strong preference for using the ventral surface is not known. It is possible that this pattern could be because of handedness of the individual, the blade edge angle, and/or it could be due the activity that is being orchestrated (Aranda et. al. 2012:50).

Figure 4.1 Primary contact side of tools from Duck Lake

The tools that have been used on the dorsal surface rather than the ventral surface are mostly retouched flakes. Retouched flakes are those flakes removed during the resharpener of a tool edge. The majority of the larger (non-retouched) flakes that were utilized were heavily utilized on the ventral surface. The remaining flakes of the sample that are utilized on the dorsal surface are smaller in nature and are identified as being a part of a larger flake that was then rejuvenated. This rejuvenation or resharpener episode creates a flake that has no wear on the ventral surface and significant wear on the dorsal surface. The retouch flakes in my sample are smaller, wider than they are long, and show significantly more wear along the dorsal surface than they do along the ventral surface. By examining the retouch flakes, I was able to not only analyze the tools themselves but patch together the signs of use, blade angle, and relative length of time a tool was used before it was being retouched.

In several cases I was able to see lighter use wear on the retouch flake scar and heavier use wear along the margins of the retouched flake scar. This demonstrates that the tools were used before and after retouch. These flakes are an example of tools being used past their primary efficiency, whatever that may be, then re-sharpened and used again.

Striations moving perpendicular to the blade edge and/or moving laterally along the blade edge demonstrate that a tool was used for cutting or scraping (Conte et. al 2015). The majority (68%) of the Duck Lake flake tools have striations that appear on the blade edge. Below is a picture (Figure 4.2) of a tool that has been utilized in a scraping motion with perpendicular striations circled in yellow. Complete striation scars such as appear in this figure are evidence of a scraping motion done repeatedly over long periods of time in activities such as hide scraping, antler working, and bone tool production (Conte et. al. 2015, Liu et. al. 2016, Knutsson et. al. 2015).

Figure 4.2 perpendicular striations from a quartz scrapper within the assemblage

The direction of tool use was determined on 68% of the tools analyzed from the Duck Lake site. While Knutsson and colleagues (2015:519) noted three categories of striations (parallel, transverse, and diagonal), in this study only lateral and perpendicular striations were noted. The materials that create the best striations are antler working, hide processing, and activities that contact with hard materials such as bone (Conte et. al. 2015, Liu et. al. 2016, Knuttson et. al. 2015).

Nearly a quarter of all the flakes exhibiting striations show signs of both scraping and cutting motions. This is more than likely the result of the tools being used for multiple activities over an extended period of time (Van Gjin 2014: 168). Of course, more experimentation is needed to evaluate this hypothesis.

Figure 4.3 Motion of the tools from Duck Lake

One of the other major traces of use on these flakes is polish. The differences in light, medium, and heavy polish could be the result of different types of activities and/or different lengths of time that these tools have been used (Figure 4.3) (Conte et. al. 2015, Knutsson et. al 2015, Sussman 1985). Organic materials seem to produce the most complete and visible kinds of polish on the tools, usually forming only on the highest areas of the microtopography, eventually smoothing out the microflake scars as more wear is attributed to the tool (Conte et. al. 2015, Sussman 1985).

Figure 4.4 Number of tools with polish accrual showing intensity of use and activity.

Figure 4.5 Percentage of tools that have polish occurring on them.

Most tools fall into the lightly used category with 43% of the entire tool population having signs of light use (Figures 4.4 & 4.5). The tools that have both light and medium or medium and heavy are labelled in the categories as light/medium and medium/heavy. These tools have polish that has medium and heavy signs of wear and then retouched with light and medium polish within the retouch episodes themselves. These tools were utilized and then sharpened and then utilized again. Based on the experimental section that was completed during this study it was determined that light polish accrues at between 5-15 minutes, medium polish accrues between 15-25 minutes, and heavy polish accrues at greater than 25 minutes.

Polish accrual has to do with the type of activity, or activities, and the length of time that the tool was used (Conte et. al. 2015, Knutsson et. al. 2015). Striations can be studied to determine the directionality and intensity of tool use (Knutsson et. al. 2015: 523).

Figure 4.6 Relationship of Polish and striations on ventral surfaces

Individually these artifacts are used in complex motions for a specific purpose (Andrefsky 1994). Figure 4.6 shows the tools from Duck Lake that have both striations and polish accrual combining signs of use can determine the overall purpose of the tools from the site. The majority of the tools at all levels of polish were utilized in a cutting motion indicating that the primary action at Duck Lake is a cutting activity. The secondary activity is a scraping activity, and a third activity that involves both cutting and scraping, perhaps a butchering activity such as fish processing.

The tools at Duck Lake are used in a variety of motions for varying degrees of time (Figure 4.6). The tools are primarily utilized on the ventral surface (Figure 4.1) with 27 of these artifacts showing retouch episodes. Figure 4.2 and Figure 4.3 show the direction of use for the tools at Duck Lake indicating that there are almost equal numbers of tools with lateral movements as there are tools that exhibit perpendicular movements. Figures 4.4 and 4.5 show the polish distribution at Duck Lake the majority of the tools having been used lightly then discarded or resharpened for further use. Figure 4.6 shows the number of artifacts that have polish and striations discussing the individual breakdown between polish categories and striation formation.

Popper

I selected 30 artifacts from the Popper site for use wear analysis. These artifacts have been selected based on several criteria. I initially selected the artifacts from Popper that were identified by Neubeaur (2016) as having been retouched, utilized, or modified for use in some manner. In order to bring the full sample of the project up to 100, I then collected the remainder of the artifacts from Popper in a sample from the site much the same way as Duck Lake. I collected the tools that were previously identified as having been utilized (19) and the remaining (11) artifacts either matched the morphology of those already identified or were retouch flakes consistent with the sample from Duck Lake.

The use-wear analysis found that the majority of the artifacts identified as tools from Popper have been utilized, as was the case at Duck Lake. Of the thirty artifacts in this assemblage, 73% were utilized, which makes sense based on the morphological characteristics of the tools themselves as described by Neubeaur 2016.

Figure 4.7 Percentage of use of artifacts from Popper

The ventral surface is the primary contact side on this assemblage as it was on the Duck Lake artifacts. Retouch episodes account for the use on the dorsal surfaces, retouch sides have sharper edges than the original ventral surface, retouch episodes reshape a tool sufficiently enough that a tool is rejuvenated to an almost new status.

Figure 4.8 Primary contact side from Popper

Retouch occurs on the Popper artifacts in several ways. The first way that retouch occurs is taking off large flakes with direct percussion from the tools to create a rejuvenated edge. The second way that retouch occurs is through pressure flaking of the lateral margins for sharpening. Figure 4.9 is an example of a flake that has pressure flaking on the utilized edge.

Figure 4.9 Tool from Popper with Use wear and retouch. 1.) Signs of moderate edge damage and medium polish. 2.) Moderate edge damage, medium polish, and lateral striations. 3.) Lateral striations. 4.) Heavy Polish. This flake also has retouch with light polish in between pictures 1&3.

At Popper I found that 47% of the tools had no striations and interpreting directionality of use was not possible. This is slightly higher than the 32% of flakes at Duck Lake that lacked information to determine directionality (Figure 4.9). One interpretation for the difference is that the Popper artifacts were utilized on materials that were not hard enough to cut into the actual stone itself. These tools were worked on less dense mediums such as butchering activities and softer organic processing (Arranda et. al. 2012, Conte et. al. 2015, Knutsson et. al. 2015, Sussman 1985).

Figure 4.10 Motions of the tools from Popper

Sample size affected my ability to determine the overall type of use for the assemblage, however the methodology was incredibly successful at determining use on the individual artifact. Figure 4.10 demonstrates that only 53% of the tools at Popper have a distinctive direction of use. 47% of the tools at popper are utilized on materials that are not leaving behind a striation.

Of the 53% of tools that do have a direction of use from Popper most of those actions concur with the Duck Lake artifacts. The majority of tools from the sample taken from both sites that do have striations are utilized in a cutting motion. In the Duck Lake site, 44% of tools have evidence of a lateral movement, whereas 40% of the tools at Popper have an action suggesting lateral movement. At Duck Lake 32% of flakes from the sample do not have directional information and 47% percent of the tools at Popper do not exhibit any directional signs of use (Figure 4.10). Most tools have been utilized on a medium, as of yet unidentified, but is harder than the stone matrix creating striations in the direction of use (Knuttsen et. al. 2015). Similar subsistence activities are happening at Duck Lake and Popper but the sample from Duck Lake

suggests that those activities, as yet unknown, are occurring more intensively at Duck Lake rather than Popper based on the striation data.

The majority of the tools have been used in a manner that either accrues no polish on the ventral surface or in a manner that accrues light polish. (Figure 4.11) Where polish could be identified, the most substantial category is light polish that accrues on the ventral surfaces. While light polish on the ventral surface was also the most common category at Duck Lake, very few artifacts, 6% of artifacts from Duck Lake showed no signs of polish.

Figure 4.11 Ventral surface polish accrual Popper

These results suggest that the Popper artifacts were used in a different manner than the tools at Duck Lake. It is unknown at this point as to what activities were being undertaken, but it is clear that the polish forms differently and the striation accrual is lighter at Popper. Below is a picture of a tool from Popper that has been utilized, though lightly, and the corresponding microscopic photographs that were taken during the analysis. This tool has been very lightly used along two edges, light polish and minimal edge damage attests to the light use of the artifact.

Figure 4.12 Flake tool with light polish from Popper. 1.) sporadic light polish 2.) Light polish upon the microtopography. 3.) Light polish on highlight of topography. 4.) More consistent light polish and striations on one part of the topography.

In the Popper assemblage, 52% of the flakes, like that shown in Figure 4.12, do not show evidence for the directionality of tool use. Without a clear distinction between a type of use and a relative length of time it is hard to determine exactly what these tools were being utilized on. It is possible that they were being utilized on the same types of materials but in different ways or for different times. As of now I am unable to determine what caused the difference in wear seen on the tools from Duck Lake and Popper, I am only able to determine that a difference exists. With further experimentation it may be possible to better understand use accrual over time and how differing mediums affect the tools that are being used to work them. By better understanding the previously mentioned processes I hope to answer more clearly the questions

about inter site differences that this study has uncovered about the purposes of the Popper and the Duck Lake sites.

CHAPTER V: CONCLUSION AND PROJECT SUMMARY

This research project created a methodology and scoring classifications on how to analyze a quartz and quartzite lithic collection. By looking at the individual flake scars on a tool it is possible to determine a scale of use. By assessing the individual microscopic flake scars it is possible to score a tool for light use, medium use, and heavy use. Within this methodology it is also possible to determine the direction of the tool based on the direction of the striations along the tools edge. I utilized a low magnification technique in this study that allowed for individual study of micro flake scars as well as provided a larger picture of the tool.

The experimental section provides some generalities about how the materials wear over time and activity. The tools from Grand Island are informal in nature (Neubauer 2016) and the goal of the study was to be actualistic and to create several general trends found on different types of materials. This present study is just a basis for future research on Grand Island. A much more in depth experimental study is necessary to understand in detail how use accrues over time and activity but also the medium worked on materials from Grand Island. I suggest that this study encompass multiple life activities from gutting activities, to bone tool formation, hide processing, acorn processing, antler processing, and other foodway and lifeway activities. These activities should be done in as diverse a means as possible. I propose that use be tracked on the tools from 5 minutes to a maximum of an hour and a half. This will give a good control for use wear accrual over time on the material but it will show precisely what activities provide what signs at what times.

What these observations mean for the tools from Duck Lake and Popper are thus: the tools from Duck Lake and Popper have differing uses as evidenced by the differences between

polish and striation formation. The Duck Lake assemblage has significant amounts of polish and deep striations. Popper has lighter forms of polish and shallower striations that appear within the assemblage. The directionality of the striations is similar between the two assemblages. This suggests that the artifacts were used for similar tasks, but perhaps more intensively and for a longer duration at the Duck Lake sample.

This evidence suggests that at Popper the inhabitants were working softer organic materials and at Duck Lake they were working much more dense robust organic materials. It is important to note, however, that there is some overlap in the types of wear, and presumably the materials being processed, at both sites. The tools from both sites were used for a range of activities, addressing the study's goal to determine and quantify the signs of use present on artifacts from Duck Lake and Popper.

Through this project I have completed the only Late Archaic use wear study from the Great Lakes region on quartzite and quartz flake tools. By selecting 100 tools from Grand Island I believe I have sampled broadly from the two sites encompassing a plethora of lifeways activities. The project was successfully able to answer my first research question in detail. There is use on tools from Grand Island and now there is a methodology to quantify signs of use on tools from Grand Island. In my experimental regimen, I tested the hypothesis that significant wear develops only over extensive time of use. I am able to say that at even 5 minutes of use tools show signs of wear that can be scored. By scoring the polish I can determine how long a tool has been utilized. At Duck Lake the tools were retouched by taking large flakes off whereas at Popper the tools were retouched by smaller pressure flaking rejuvenation episodes. (At least on the sample that I have chosen).

In this study I was able to determine use/disuse on tools from Popper and Duck Lake. This analysis of the tools from Duck Lake and Popper did show a consistent correlation between tools identified macroscopically and the tools that showed evidence of microscope use. The present study did show that there are tools that were missed through macroscopic analysis and a typology based on microwear study and morphology such as suggested in Knutsson et al. (2015) should be created.

By identifying different levels of polish formation on the artifacts I was able to identify tools with varying degrees of utilization. Though it is important to remember that polish does not always correlate with time, polish formation also is affected by medium worked (Keeley 1980). The study did identify differing use patterns between the sites and the individual artifacts themselves based on the polish accrual on the tools. The method of study employed in this study creates a repeatable scoring method to determine use wear accrual on stone tools created from heterogeneous materials.

Based on the archaeological evidence from Grand Island, Michigan these two Late Archaic sites are persistent places on the landscape. That is, they are places where populations are returning to on a seasonal basis, allowing kinship ties to be bolstered, communal ties to the environment to be created, and stores of subsistence materials can be garnered (Drake et. al. 2004, Smith et. al. 2016). The Upper Peninsula of Michigan is a region where many resources are in abundance; wildlife, aquatic resources, nuts, berries, and tubers are all able to be appropriated in large quantities allowing the previously mentioned communal ties to flourish (Anderton 2009, Drake et. al. 2004, Neubauer 2016, Smith et. al. 2016). Technologically the inhabitants developed a tool kit that is equally as complex as the environment that they inhabited. Concurrently, the expedient technology and the role that it played in site formation, site use, and

it's longevity upon the landscape attest to this fact. In studying the expedient tools I was able to create a methodology to help study the complexities of the Late Archaic on Grand Island that were laid out in the 2016 Dissertation of Fernanda Neubauer.

In the future, I would advocate for a much larger sample of tools to be analyzed from Duck Lake and Popper using my methodology. By using my methodology it will allow for some consistency between analysts and materials being analyzed. In addition to the expanded sample size, I believe that a replication study should be implemented to understand the replicability of this methodology. The next study with a larger sample size and a distinctly different replicability study should be paired with a much more exhaustive experimental regimen. A bolstered and much more robust experimental regimen will provide a much more in depth view of the Late Archaic as a whole in the Upper Peninsula of Michigan, these sites in specific, but will also supplement the preliminary data that has been proposed in this thesis. In the implementation of this project I have successfully created a methodology to test use wear on quartz and quartzite, I have created a scoring method to score intensity of use, and I have demonstrated that use wear on quartz and quartzite expedient tools is a viable option to recreate past life ways.

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APPENDIX A: USE WEAR DATA CHART

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #1	03-1056 Duck Lake	494N 498E Level 2	No	NA	NA	NA	NA	NA	NA	NA	31.32	36.76	13.75		Macroscopic edge reworking no microscopic evidence of use	Grey Quarrrzite
Artifact #2	03-1056 Duck Lake	494N 498E Level 2	Yes	Stirations (lateral) /Medium polish	Striations (Lateral), Medium Polish, macroscopic edge damage	Lateral Striations, Medium Polish, and macroscopic edge damage	Ventral Surface	Dorsal Surface	NA	NA	39.5	21.92	7.82	Lateral cutting motion		White Quartzite
Artifact #3	03-1056 Duck Lake	494N 498E Level 2	Yes	Lateral Striations, Medium Polish, edge damage	Lateral Striations, Medium polish, edge damage	Lateral Striations, Medium Polish, and microscopic edge damage	Ventral Surface	Dorsal Surface	Na	NA	41.73	24.78	7.55	Lateral cutting motion	extreme edge damage along the flake and extensive signs of use	White Quartzite
Artifact #4	03-1056 Duck Lake	494N 498E Level 4c	Yes	Heavy polish, extensive edge damage, lateral and perpendicular striations	Medium Polish, Striations Lateral and Perpendicular	Striations Lateral and Perpendicular, Medium and Heavy polish, as well as microscopic edge damage	Ventral Surface	Dorsal Surface	All edges show same signs of use	All edges show same signs of use	43.53	36.21	10.67	Lateral cutting motion as well as a perpendicular scraping motions	Flake scarring on the Dorsal surface suggests a resharpening episode, The Ventral surface contains more polish whereas the dorsal surface contains more striations	Quartzite
Artifact #5	03-1056 Duck Lake	494N 498E Level 4c	Yes	Light polish, Lateral and Perpendicular striations	Light polish, Lateral and Perpendicular striations	Light polish, lateral and perpendicular striations	Ventral Surface	Dorsal Surface	Similar signs of use on all edges	Similar signs of use on all edges	42.13	39.63	12.76	Lateral cutting motion as well as a perpendicular scraping motions	The blunt side of the tool shows heavier polish than the use edges suggesting hand wear or a haft element,	White Quartzite
Artifact #6	03-1056 Duck Lake	409N 500E Level 6	Yes	Medium/Heavy Polish, Pocking, striations, edge	Medium Polish, Striations Lateral and Perpendicular	Medium/heavy polish, Lateral and Perpendicular striations,	Ventral Surface	Dorsal Surface	Ventral side of "triangle"	Dorsal Side of "Triangle"	37.79	30.13	13.82	Lateral cutting motion as well as a perpendicular	The polish on the Ventral surface extends much more into the interior of the flake than does the polish on the	Grey Quarrrzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
				damage, and Heavy deep striations	lar, edge damage	pocking, and edge damage								lar scraping motions	Dorsal surface. Most heavily utilized as a scrapper.	
Artifact #7	03-1056 Duck Lake	498N 502E Level 3	Yes	Two use edges: Cutting edge light polish and light parallel striations. Scraping edge: Pocking perpendicular striations, and medium/heavy polish. Several flakes are missing either due to use or retouch.	Light polish, Lateral and Perpendicular striations	Light, Medium/Heavy polish, Lateral and perpendicular striations, pocking, and edge damage	Ventral Surface	Dorsal Surface	Scraping side on Ventral surface	Cutting Side Ventral surface	38.55	31.23	12.67	Cutting motion as well as perpendicular scraping motions	The piece has been utilized on two sides though the Ventral surface is the primary contact side. The both surfaces have flakes missing with use in the larger flake scars. This is due to either retouch or use.	Grey Quartzite
Artifact #8	03-1056 Duck Lake	498N 502E Level 3	Yes	Edge Damage, Light Polish	Light polish	Light polish and Edge damage	Ventral surface	Dorsal Surface	NA	NA	18.08	43.86	13.39	Na	This tool is very lightly used	Pink Quartzite
Artifact #9	03-1056 Duck Lake	494N 498E Level 2	Yes	Heavy polish, extensive edge damage, limited striations (lateral), and light pocking	Medium Polish, pocking, and edgewear	Medium and Heavy polish, pocking, lateral striations, and edgewear	Ventral surface	Dorsal Surface	Ventral surface 3 sides	Dorsal surface three sides	46.78	21.65	9.55	cutting motion though the incidence of pocking could be evidence of graving based on the morphology of the tool.	This tool is heavily used on both surfaces though more so on the Ventral surface. The pocking is deep and limited to the morphological point of the tool. This tool exhibits no retouch and is considered to be heavily used.	White Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #10	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	Very light sporadic polish	Light polish, limited lateral striations, very light edge damage	Light polish, limited lateral striations, and very light edge damage	Dorsal surface	Ventral surface	Dorsal Lateral Margin	Na	45.89	35.42	13.58	Lateral cutting motion, though it is important to note this flake is very lightly used	Overall this tool is very lightly used and signs of use are sporadic, this tool is utilized just enough to be called utilized.	White Quartzite
Artifact #11	03-1056 Duck Lake Site	495N 500E Level 4	Yes	Pocking, edgewear, striations, and heavy polish	Medium/Heavy Polish, lateral striations,	Pocking, Edgewear, Heavy/Medium Polish, and Lateral striations	Ventral Surface	Dorsal Surface	Ventral Lateral Margin	NA	27.12	17.48	8.32	Lateral cutting motion	This flake is very heavily utilized and all areas on the Ventral surface show signs of use. The Dorsal Surface is mainly cortex and only shows extensive use on the non cortical areas.	White Quartzite
Artifact #12	03-1056 Duck Lake Site	494N 498E Level 4	Yes	Medium Polish, Lateral Striations, Pocking	Medium Polish, Lateral Striations, Moderate Edge Damage, Pocking	Medium Polish, Lateral Striations, Moderate Edge Damage	Ventral Surface	Dorsal Surface	Ventral Surface Lateral Margin	NA	50.97	30.65	12.49	Lateral Striations	Very well utilized flake, Ventral is as per usual is more heavily utilized	
Artifact #13	03-1056 Duck Lake Site	498N 504E Level 7	Yes	Striations, Medium Polish, and excessive edge damage	Medium Polish, Lateral Striations, Moderate Edge Damage, Pocking	Medium Polish, Lateral Striations, Moderate Edge Damage	Ventral Lateral Margins	NA	Ventral Lateral Margin	Na	35.56	17.98	4.64	Lateral motion	Dorsal surface has significant cortex, none cortical edges show signs of use.	White Quartzite
Artifact #14	03-1056 Duck Lake Site	501N 501E Level 6	Yes	Medium Polish, Lateral Striations, Pocking	Striations (Lateral), Medium Polish, macroscopic edge damage	Medium Polish, Lateral Striations, Pocking, and limited edge damage	Lateral margins Ventral Surface	Lateral Margins Dorsal Surface	Lateral Margins ventral surface	Lateral Margins Dorsal Surface	37.67	32.54	13.67	Lateral Motion	Bipolar red flake with extensive use on the lateral Margins, The Ventral Surface is more heavily worked than the Dorsal surface.	Purple quartzite
Artifact #15	03-1056 Duck Lake Site	501N 501E Level 6	Yes	Medium Polish, Lateral Striations, and light edge damage	Light/Medium Polish, Perpendicular Striations, and light edge damage	Light/Medium Polish, perpendicular Striations, and light edge damage.	Ventral	Dorsal	"Triangle of use" all edges used but the back. Ventral Side	Dorsal "Triangle of Use"	22.94	18.9	5.61	Scraping motion	Primary sign of use are the striations within this flake, though small, used in a scraping motion.	White Quartzite
Artifact #16	03-1056 Duck Lake Site	501N 501E Level 6	Yes	Light Polish, light edge damage	Medium Polish, Moderate Edge Damage	Light/Medium Polish, Light/Moderate Edge Damage	Dorsal surface	Ventral surface	Dorsal Lateral Margin	NA	15.85	13.33	3.45	NA	The Dorsal Side is the most heavily utilized on this flake, I believe this flake to be a Retouch episode.	White Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #17	03-1056 Duck Lake Site	498N 504E Level 6	Yes	Light Striations, Light Polish, Light Pocking, and light edge damage	Light Polish, Light Pocking, and heavy edge wear	Light Polish, Light Pocking, light/moderate edge damage	Ventral surface	Dorsal surface	Lateral Margins ventral surface	Na	43.91	25.23	7.04	NA	The Ventral surface shows the most signs of use but the whole flake has a pretty thorough amount Use wear consistently throughout.	White Quartzite
Artifact #18	03-1056 Duck Lake	494N 498E Level 4b	Yes	Heavy Polish, Lateral Striations, Pocking, and limited edge wear	Lateral Striations, Heavy Polish, Pocking, and extensive edge wear	Lateral striations, Heavy Polish, Pocking, and limited to extensive edge wear	Ventral	Dorsal	Lateral Margins ventral surface	Lateral Margins Dorsal Surface	36.64	19.48	7.78	Cutting	The Ventral surface shows the most significant signs of use though wear is distributed all over the flake on all sides. The Dorsal surface is primarily cortex.	White Quartzite
Artifact #19	03-1056 Duck Lake Site	494N 498E Level 4b	yes	Heavy Polish, Heavy lateral striations, pocking, and edge damage	Extensive edge wear, heavy polish, light striations	Heavy polish, extensive edge wear, pocking, and light/Heavy lateral striations	Ventral	Dorsal	Lateral Margins ventral surface	Lateral Margins Dorsal Surface	27.46	30.46	7.18	Cutting	the ventral surface is the leading edge of the tool, extremely heavy use.	White Quartzite
Artifact #20	03-1056 Duck Lake Site	494N 498E Level 4b	Yes	Heavy polish, Light/Heavy perpendicular and Lateral striations, and extreme edge wear	Light polish, light pocking, and light edge damage	Light/Heavy Polish, lateral and perpendicular striations, extreme to light edge wear, and light pocking	Ventral	Dorsal	Ventral lateral margin	Ventral Lateral Margin	52.3	31.52	13.38	Scraping on the primary used edge and cutting on the secondary use edge	The ventral surface has both primary use edges, The dorsal surface is largely unused with light signs of use.	White Quartzite
Artifact #21	03-1056 Duck Lake Site	501N 501E Level 5	Yes	Light polish, perpendicular striations, and extreme edge wear	Heat treated Cortex no signs of use	Light polish, perpendicular striations, and extreme edge wear	Ventral	Na	Ventral "Triangle of use"	NA	52.3	28.83	11.97	Scraping motion	The ventral surface is the leading edge of the tool, and contains the most significant signs of use.	
Artifact #22	03-1056 Duck Lake Site	501N 501E Level 5	Yes	Light/Medium polish, indeterminate striations,	Largely Cortical, minimal signs of use due to the cortex	Light/Medium Polish, indeterminate striations	Ventral surface	Dorsal Surface	Ventral Lateral Margin	Ventral Frontal Margin	35.55	34.28	5.87	Primary use edge cutting motion/Secondary use edge Indeterminate	Medium Polish occurs along the secondary use edge, though the primary use edge has significant striations as well as heavy light polishing and is used in a cutting motion	White Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #23	03-1056 Duck Lake Site	498N 502E level 4b	Yes	Light polish, light edge damage	Light Polish, Macroscopic reworking	Light polish, and light edge damage	Ventral surface	Dorsal Surface	Ventral Lateral Margin	NA	55.33	35.5	19.93	Na	This piece is a utilized piece of FCR and is very difficult to analyze on the Dorsal surface with the cortex. Though largely the signs of use are distorted due to the thermo modification.	Grey Quartzite
Artifact #24	03-1056 Duck Lake Site	498N 500E Level 5	Yes	light polish, edge damage, and limited indeterminate striations	light polish and edge damage	Light polish, edge damage, and limited indeterminate striations	Ventral surface	Dorsal surface	Front edge "Scraper edge"	NA	33.01	24.64	9.1	Na	This piece is very lightly used, though in the form of a scraper it was very lightly used	White Quartzite
Artifact #25	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	Medium polish, Large perpendicular striations, pocking, and edge damage	Light polish, perpendicular striations, and light pocking	Light/Medium Polish, perpendicular striations, edge damage, and light pocking	Ventral surface	Dorsal Surface	Ventral Surface "Triangle of use"	Dorsal surface "Triangle of use"	35.39	21.8	6.25	Scraping	This piece has a large amount of cortex on the Dorsal surface, this piece was used on the ventral surface primarily then flipped and use on the dorsal surface for a very similar task.	White Quartzite
Artifact #26	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	light polish, light edge damage, and one instance of pocking	light polish, light edge damage	light polish and light edge damage	Ventral Surface	Dorsal Surface	Ventral Surface Lateral Margin	NA	32.47	25.75	7.4	NA	This piece is very lightly used and has many crystalline impurities. The matrix looks to appear to hide some signs of use from the analyst. There is a Dorsal scar that looks like a blade or bladelet based on the size and shape of the flake scar.	Grey Quartzite
Artifact #27	03-1056 Duck Lake Site	498N 504E Level 6	Yes	Medium polish, pocking, lateral striations, and extreme edgewear	edge damage, medium polish, striations, and light pocking	Medium polish, edge damage, lateral striations, and light pocking	Ventral surface	NA	Ventral Lateral Margin	NA	39.84	29.35	11.72	Cutting	The Ventral surface is the most heavily utilized on this flake, though the dorsal surface is cortex. It appears to be a meat cutting implement	White Quartzite
Artifact #28	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	Lateral striations, pocking, light polish, and extensive edge damage	Medium Polish, perpendicular striations, and massive edge damage	Light/Medium Polish, lateral and perpendicular striations, and extensive edge damage	Ventral surface	Dorsal surface	All edges show same signs of use	Na	31.39	27.43	7.36	Cutting and Scraping	Even signs of wear along the entire flake, the Dorsal surface shows heavy modification, this tool was used in both a cutting and scraping motion.	Red Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #29	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	light polish, light striations, and moderate edge attrition	light polish and limited edge wear	light polish, light striations, and limited/moderate edge attrition	Ventral surface	Dorsal Surface	Even signs of use	NA	21.75	16.41	6.38	NA	Lightly used, just enough to be called used, use edge could not be determined	white quartz
Artifact #30	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	Medium/Heavy polish, pocking lateral striations, and significant edge damage	Lateral striations, pocking, medium/heavy polish, and edge wear	Medium/Heavy polish, Lateral striations, edge damage	Ventral surface	Dorsal Surface	Ventral Lateral Margin	Ventral Lateral Margin				Cutting	Heavy use on the Ventral surface, tool has two lateral margins on the ventral surface. Both of them are used, one's the primary use edge and the other is the secondary use edge.	
Artifact #31	03-1056 Duck Lake Site	498N 500E Level 5	No	NA	NA	NA	NA	NA	NA	NA	17.75	13.74	4.78	NA	Biface, this is a thermally modified bit of red quartzite that is expertly knapped into a biface.	White quartzite
Artifact #32	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	Medium signs of polish, vertical and lateral striations	Light/Medium Polish, Perpendicular Striations, and light edge damage	Light/Medium polish, vertical and lateral striations, light edge damage	Ventral Surface	Dorsal Surface	Lateral Margin	Front leading edge	30.27	18.74	9.36	Cutting and Scraping	Light and medium use edges along both sides of the tool, used in a cutting edge on the lateral margin and the front leading edge is a scraper	white quartz
Artifact #33	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	Heavy polish, perpendicular striations, and pocking	Heavy polish, pocking, and perpendicular striations	Heavy polish, extensive edge wear, pocking, and light/Heavy perpendicular striations	Ventral surface	Dorsal surface	Lateral Ventral Margin	Distal Margins Ventral Surface	30.16	18.65	9.23	Scraping motions on both blade edges	Light to medium use on both sides of the tool, there are dual signs of use along the ventral side, the dorsal surface is spotted with cortex affecting the analysis of that surface	White Quartz
Artifact #34	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	light polish, lateral striations, and edge damage	light polish, pocking, lateral striations	light polish, pocking, lateral striations, and edge damage	Ventral surface	Dorsal surface	Lateral Ventral Margin	Lateral margin Dorsal surface	55.38	33.9	19.14	Cutting motion	Heavy cortex on the dorsal surface but the modified dorsal edge displays many signs of use. Though very heavily used (the signs of use are consistent) the Use wear is still light	Grey Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact # 35	03-1056 Duck Lake Site	498N 504E Level 7	Yes	Heavy polish, lateral and perpendicular striations, pocking, and extreme edge wear (Possible Haft)	Complete Cortex no signs of wear	Heavy polish, lateral and perpendicular striations, pocking, and extreme edge wear	Ventral surface	Na	Na	Na	40.54	28.58	8.12	Cutting and scraping motion	This tool has extensive cortex on the dorsal surface and despite this is very heavily used on the ventral surface.	White Quartz
Artifact #36	03-1056 Duck Lake Site	495N 500E Level 3	Yes	Sporadic light polish	light polish	light polish	Ventral surface	NA	Na	NA	44.97	25.1	8.07	Na	Just enough use to say it is used, thermally modified and thus distorts signs of use.	
Artifact # 37	03-1056 Duck Lake Site	494N 498E Level 3	Yes	Medium polish, moderate edge damage	medium polish and edge damage	medium polish and moderate edge damage	Ventral surface	Dorsal surface	Ventral Front edge "Scraper edge"	Dorsal Front leading edge	38.44	32.98	11.1	NA	Use indeterminate but the morphology of the tool is very similar to a scraper.	Grayish Quartzite
Artifact # 38	03-1056 Duck Lake Site	Unprovenienced	Yes	Light/medium polish, limited edge damage	Medium Polish, Lateral Striations, Moderate Edge Damage	Light Medium polish, lateral striations, moderate edge damage	Dorsal surface	Ventral surface	Dorsal Lateral Margin	Dorsal Lateral Margin	26.4	15.86	4.64	Cutting	This is a small flake and consistent with the idea that it is a retouch flake having been used on a tool and then knapped off in a resharpening episode	Red Quartzite
Artifact # 39	03-1056 Duck Lake Site	Unprovenienced	Yes	Light polish, lateral striations	Medium polish, perpendicular striations, and significant edge damage	Light/Medium polish, perpendicular striations, and significant edge wear	Dorsal surface	Ventral surface	All edges show same signs of use	Na	26.7	15.97	4.21	Scraping	This is a small flake and consistent with the idea that it is a retouch flake having been used on a tool and then knapped off in a resharpening episode	Purple quartzite
Artifact #40	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	light polish, pocking, and light edge wear	light polish	light polish, pocking, and light edge wear	Ventral surface	NA	Lateral Ventral Margin	Na	37.37	32.26	15.78	Na	Dorsal surface has significant cortex, none cortical edges show signs of use. The Ventral surface is showing much more signs of use than the Dorsal	Red Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact # 41	03-1056 Duck Lake site	Unprovenienced	Yes	Medium polish, pocking, and moderate edge damage	Light polish, light edge damage	Light/ Medium polish, light/moderate edge damage	Ventral surface	Dorsal surface	Lateral margin ventral surface	Lateral margin Dorsal surface	36.85	20.63	7.84	NA	Both sides of this flake have had flakes taken off of them, this flake is very much well used even though the use signs aren't all that concentrated. There are use marks within the flake scars, indicating that the tools were used post modification.	Purple quartzite
Artifact #42	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	Light/Medium polish, lateral striations, and significant edge damage	Medium polish, Lateral and Perpendicular striations, pocking, and moderate edge wear	Light/Medium polish, lateral and perpendicular striations, and moderate edge damage	Ventral surface	Dorsal Surface	Lateral margin ventral surface	Lateral margin Ventral surface	25.21	16.91	7.63	Cutting and Scraping	Medium polish abound throughout the whole flake, edge damage, and striations indicate a flake that has been heavily used.	Purple quartzite
Artifact #43	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	light polish, edge damage, lateral striations,	light/Medium polish, lateral striations, moderate edgewear	light/medium polish, lateral striations, moderate edge damage	Dorsal surface	Ventral surface	Lateral margin dorsal surface	Lateral margin Ventral surface	25.43	17.05	7.44	Cutting	The main contact side of this flake is the dorsal surface, indicating that with it's size, this is a retouch flake, there is however too much use on the Ventral surface to be a retouch flake	Purple quartzite
Artifact #44	03-1056 Duck Lake Site	498N 502E level 4b	Yes	Medium Polish, perpendicular striations, moderate edge damage	Pocking, light/medium polish, moderate edge wear	Light/Medium polish, perpendicular striations, pocking, and moderate edge wear	Ventral surface	Dorsal surface	Proximal end ventral surface	Proximal end dorsal surface	32.77	33.34	9.09	Scraping	This flake is very well utilized with consistent polish up to the medium grade on both sides of the tool.	Pink Quartzite
Artifact #45	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	Light/Medium Polish, perpendicular striations, and edge damage	Dorsal surface is all cortex, no Use wear/present	light/medium polish, perpendicular striations, and edge damage	Ventral surface	NA	Ventral Proximal end	Ventral Dorsal end	29.93	17.44	4.92	Scraping	Heavily modified tool with significant signs of use, the dorsal surface is all cortex and the ventral are reworked and heavily damaged.	Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact # 46	03-1056 Duck Lake Site	498N 502E Level 4b	Yes	Heavy polish, perpendicular striations, pocking, and extreme edge damage	Heavy polish, pocking, perpendicular striations, and heavy edge damage	Heavy polish, perpendicular striations, pocking, and extreme edge damage	Ventral surface	Dorsal Surface	Ventral "Triangle of use"	Dorsal "Triangle of Use"	22.75	34.93	12.35	Scraping	This flake was very heavily used for some extensive scraping motion and has been use past maximum attrition	White Quartz
Artifact # 47	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	light polish, light edge wear, and edge modification	This side is cortex and no signs of use were discovered	light polish, light edge wear, and edge modification	Ventral surface	Dorsal Surface	Not able to be determined due to the consistency of use on the Ventral surface		28.99	20.69	6.58	Na	light polish throughout the ventral surface as well as consistent edge wear and reworking indicate a light use episode after modification	Blue/Purple Quartzite
Artifact #48	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	Light polish and light edge damage	primarily cortex but light polish and edge damage where the cortex is rolled back	light polish and light edge damage	Ventral surface	Dorsal Surface	Leading edge Ventral surface	Leading edge Dorsal Surface	35.93	38.16	10.54	Na	Ventral surface is quite lightly used and the dorsal surface is 70% cortex and is difficult to read but contains light polish as well.	White quartzite
Artifact # 49	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	light polish and light edgewear	Medium polish, pocking, and moderate edgewear	Light/medium polish, pocking, and light/moderate edgewear	Dorsal surface	Ventral surface	Dorsal Leading edge	Dorsal following edge	28.58	41.51	9.73	NA	The Dorsal side is the most heavily utilized on this flake, the secondary edge is most likely signs of prehension wear	White quartzite
Artifact # 50	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	Medium Polish, Lateral Striations, and light edge damage	Medium/H eavy Polish, lateral and perpendicular striations, pocking, and heavy edge wear	Medium/heavy polish, Lateral and Perpendicular striations, pocking, and heavy edge damage	Dorsal surface	Ventral surface	Dorsal surface lateral margin	NA	24.32	11.53	5.91	Cutting and Scraping	The Dorsal surface is the most heavily used on this surface this flake is small and should be a retouch flake but with the evidence on the ventral surface too, I'm not sure as of yet what this is.	White Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact # 51	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	light polish, light edge wear, and edge modification	Light Polish and light edge damage	Light polish and light edge damage	Ventral Surface	Dorsal surface	Signs of wear are too consistent	Na	42.47	38.9	12.6	Na	This flake is very lightly used, the dorsal surface is largely cortex and exhibits very little signs of use	Quartzite
Artifact # 52	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	Light/medium polish, perpendicular striations, pocking, and light edge damage	Medium/heavy polish, pocking, moderate edge damage, Lateral and perpendicular striations	Light/Medium/Heavy polish, lateral and perpendicular striations, pocking, light/moderate edge damage	Dorsal surface	Ventral surface	Dorsal Lateral Margin	Dorsal Lateral Margin	42.69	19.16	7.58	Cutting and Scraping	Very heavily utilized flake, the dorsal surface is the leading edge and contains both primary and secondary use edges	Purple quartzite
Artifact #53	03-1056 Duck Lake Site	494N 498E Level 4a	Yes	light polish, little pocking, and light edge damage	Light polish	Light polish, little pocking, and light edge damage	Ventral surface	Dorsal surface	Ventral Front edge "Scraper edge"	Dorsal Front leading edge	61.33	43.92	20.9	Na	The ventral surface is the most heavily utilized on this flake, though it is not significantly so, and the dorsal surface had a flake removed post use as there are no Use wear marks within the flake scar.	Grey Quartzite
Artifact #54	03-1056 Duck Lake Site	494N 498E Level 4b	Yes	Light polish, light edge damage, lateral striations	light polish, and very light perpendicular striations	light polish, light edge damage, lateral and perpendicular striations	Ventral surface	Dorsal surface	Ventral Lateral Margin	Dorsal Distal margin	49.46	27.67	9.86	Scraping and cutting	This flake has two different use areas. One on each side of the tool. The Ventral was used in a cutting motion and the Dorsal in a scraping motion. The ventral surface has a flake removed pre use as there are signs of use within the flake	White Quartzite
Artifact #55	03-1056 Duck Lake Site	494N 498E Level 4b	Yes	Light/Medium polish, Lateral striations, pocking, and moderate edge wear	Medium/heavy polish, Extreme edge wear, and lateral striations	Light/Medium/Heavy polish, lateral striations, pocking, Heavy/moderate edge damage	Dorsal surface	Ventral surface	Signs of wear are too consistent	NA	41.55	35.28	13.66	Cutting	Edge reworking and extreme signs of use in addition to flakes being taken off of each side of the tool makes this a "biface" or a "Core Tool" Swiss army knife type tool	Red Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #56	03-1056 Duck Lake Site	498N 504E Level 2	Yes	light polish, limited edge wear	light polish	Light polish, and light edge damage	Ventral surface	Dorsal surface	Ventral margin	Na	32.96	24.96	9.19	Na	There is a dorsal flake scar with light signs of use, this flake was prepared and then discarded after light use	White Quartzite
Artifact #57	03-1056 Duck Lake Site	492N 496.5 E Level 5	Yes	Heavy polish, pocking, and very deep perpendicular and lateral striations	Heavy polish and pocking	Heavy polish, pocking, lateral and perpendicular deep striations	Ventral surface	Dorsal surface	Signs of wear are too consistent	Na	32.54	29.05	14.67	cutting and scraping	Very heavy use on this flake the dorsal surface is primarily cortex up to 90% and it is only visible on the surfaces that have the cortex rolled back.	White Quartz
Artifact #58	03-1056 Duck Lake Site	492N 496.5 E Level 5	Yes	Medium polish, lateral striations, moderate edge damage	Medium polish, pocking, and moderate edgewear	Medium Polish, Lateral Striations, Moderate Edge Damage	Ventral Surface	Dorsal Surface	Dorsal "triangle of use"	Na	26.85	16.1	6.38	cutting	Moderately well used flake used in a cutting motion and both sides show consistency of wear	White Quartz
Artifact #59	03-1056 Duck Lake Site	492N 496.5 E Level 5	Yes	Heavy polish, pocking, and deep perpendicular striations	light/medium polish, light pocking, and perpendicular striations	light/medium/heavy polish, pocking, perpendicular striations	Ventral surface	Dorsal surface	Ventral Lateral Margin	Dorsal Lateral Margin	18.79	23.94	7.4	Scraping	Heavily used flake as the ventral surface the main contact side used in a scraping motion	White Quartz
Artifact #60	03-1056 Duck Lake Site	492N 496.5 E Level 5	Yes	Light polish, lateral and perpendicular striations, light edge damage	light polish, and very light perpendicular striations	light polish, perpendicular striations, and light edge wear	Ventral surface	Dorsal surface	Ventral Lateral Margin	Dorsal Lateral Margin	19.53	12.18	4.5	Scraping	light polish throughout the flake on both sides, though more evident on the Ventral, this flake appears to have been quite used and is very odd especially for a flake that is so small	White Quartz
Artifact #61	03-1056 Duck Lake Site	492N 496.5 E level 7	Yes	Medium polish, lateral and perpendicular striations, moderate edge wear	Medium polish, moderate edge damage, pocking, and very deep lateral and perpendicular striations	Medium polish, lateral and perpendicular striations, pocking, and moderate edge damage	Dorsal surface	Ventral surface	Lateral margin dorsal surface	Lateral margin Dorsal surface	22.29	17.66	3.81	cutting and scraping	The dorsal surface has the most signs of wear on it, This flake is quite small and doesn't make sense as to how this is a tool that is used	White quartz

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact # 62	03-1056 Duck Lake Site	492N 496.5 E Level 7	Yes	Heavy polish, deep perpendicular and lateral striations, extensive edge damage	Heavy polish, Deep perpendicular striations, pocking, and extreme edge wear	Heavy polish, deep perpendicular striations, pocking, and extensive edge damage	Ventral surface	Dorsal surface	Ventral front edge	Dorsal Front leading edge	19.97	12.21	4.15	Scraping	This is a very heavily use flake that was used in a scraping motion despite its small size	White Quartz
Artifact #63	03-1056 Duck Lake Site	492N 496.5E Level 7	Yes	Medium polish, lateral striations, moderate edge damage	Lateral striations, medium polish, and moderate edge damage	Medium polish, lateral striations, and moderate edge damage	Ventral surface	Dorsal Surface	Lateral Straight Edge Ventral	Lateral Straight edge Dorsal surface	37.91	21.62	6.64	Cutting	This piece has consistent signs of wear on all surfaces/edges but primary contact side is the ventral surface. Dorsal surface is reworked heavily. I believe this is a thinning flake that is later used as a tool	White Quartz
Artifact #64	03-1056 Duck Lake Site	498N 504E Level 7	Yes	Light sporadic polish	Light polish, perpendicular striations, and lateral striations	Light polish, lateral and perpendicular striations	Dorsal surface	NA	Dorsal Lateral Margin	Other dorsal Lateral Margin	26.83	13.82	5.54	Cutting and Scraping	The extreme light use on the ventral surface and the primary contact side and morphology of the flake on the Dorsal surface suggest this is a thinning or resharpening flake that was knapped in a resharpening episode	Red Quartzite
Artifact #65	03-1056 Duck Lake Site	498N 504E Level 7	Yes	Light polish, moderate edge damage, lateral and perpendicular striations	Medium polish, perpendicular striations	Light and medium polish, lateral and perpendicular striations	Dorsal surface	Ventral surface	Dorsal Lateral Margin	Na	19.92	17.28	5.69	Cutting and Scraping "L" shaped striations	Evidence for scraping and cutting even though this flake is small. "L" shaped striations possibly associated with butchering	Grey Quartzite
Artifact #66	03-1056 Duck Lake	498N 504E Level 7	Yes	Light polish, perpendicular striations, and light edge damage	Consistent Light Polish	Light polish, perpendicular striations, and light edge damage	Dorsal surface	Ventral surface	Dorsal Front and lateral margin	Ventral Frontal Margin	30.39	19.88	8.84	Scraping motion	Heat treated flake but it is lightly used none the less, doesn't fit any normal pattern for tools as thus seen	Heat treated red quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #67	03-1056 Duck Lake Site	498N 504E Level 1	Yes	Light polish, perpendicular striations	No signs of use all cortex	Light polish and perpendicular striations	Ventral Surface	Na	Ventral Lateral Margin	Na	68.89	38.17	13.21	Scraping motion at least	Very light used, and there is a flake scar along the use edge that has use but less than the surrounding areas	Grey Quartzite
Artifact #68	03-1056 Duck Lake Site	498N 504E Level 2	Yes	Cortex	Cortex	Light polish and moderate edged damage	Lateral Margins	Na	Lateral Margin	Na	44.87	23.86	11.13	Na	Both Ventral and Dorsal surfaces are made of cortex and thus only the lateral margins present a scrapper like dull edge that has the matrix of the cortex in it. This is the only signs of use on the flake	Grey Quartzite
Artifact #69	03-1056 Duck Lake Site	498N 504E Level 2	No	Cortex	Cortex	Na	Na	Na	Na	Na	33.26	36.06	13.44	Na	Though this is heat treated and has a significant amount of cortex on both ventral and Dorsal surfaces there is a lateral margin that could be used as a scrapper but it is not	Heat treated Grey quartzite
Artifact #70	03-1056 Duck Lake Site	498N 504E Level 2	Yes	Light/Medium Polish,	Light/Medium Polish	Light/Medium Polish	Ventral Lateral Margins	Dorsal Lateral Margin	Lower Lateral Margin	Upper Margin	82.01	19.39	22.48	Na	This is a wedge shaped piece and it is quite interesting as the point has very similar uses on both surfaces and the top part that is cortex has the same as well. Odd tool type/shape	Red Quartzite
Artifact #71	03-825 Popper Site	485N 498E Level 5	No	NA	NA	Na	Na	Na	Na	Na	45.22	23.71	8.16	Na	This piece is a chert Biface that was broken during excavation (Skibo) and it is not used nor hafted.	Chert

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #72	03-825 Popper Site	476N 500E Level 6	No	Na	NA	Na	Na	Na	Na	Na	72.39	31.58	9.53	Na	This piece is a chert Biface that is complete and is hafted but isn't used. This is a good beautiful piece but isn't used.	Chert
Artifact #73	03-825 Popper Site	484N 495E Level 2	No	Na	NA	Na	Na	Na	Na	Na	50.24	25.54	7.71	Na	This piece is a chert biface that is complete and is hafted but isn't used. Interesting side note this is made from bayport chert that out crops 200km (Neubaeur 2016) from the Island	Bayport chert
Artifact #74	03-825 Popper site	486N 495E Level 3	Yes	Light polish, lateral and perpendicular striations	Light/Medium polish perpendicular striations	Light/Medium polish and lateral and perpendicular striations	Dorsal surface	Ventral surface	Dorsal Lateral margin	Other dorsal Lateral Margin	44.63	49.89	13.46	Scraping and cutting	This piece has dorsal reworking in the form of two flakes taken off. The flake scars show signs of use and help form the primary use edge.	White Quartzite
Artifact #75	03-825 Popper Site	476N 502E Level 3	Yes	Medium polish and perpendicular striations	All Cortex	Medium polish and perpendicular striations	Ventral surface	NA	Ventral Lateral Margin	Na	49.98	39.43	17.69	Scraping	This piece is an odd shape and has odd markings, it's like it's a heat treated flake but it's not quite a quartzite either.	Not identified
Artifact #76	03-825 Popper Site	476N 502E Level 3	No	Na	NA	Na	Na	Na	Na	Na	32.88	18.09	10.53	Na	This piece is a wedge and is not utilized	Not identified
Artifact #77	03-825 Popper Site	485N 496E Level 2	Yes	Light/Medium polish, lateral striations and moderate edge damage	Light polish and lateral striations	light/medium polish, lateral striations, moderated edge damage	Ventral	Dorsal	Ventral retouch edge	Lateral Ventral margin	34.1	27.68	11.89	Cutting	This piece is unique in the sense that it has two use edges and shows wear on both sides of both use edges	Grey Quartzite
Artifact #78	03-825 Popper Site	484N 494E Level 3	Yes	Medium polish on all margins	Medium polish all margins	Medium polish	Ventral	Dorsal	Ventral retouch edge	Dorsal retouch edge	34.83	21.2	10.68	Na	This piece is utilized very thoroughly but only is used with consistent medium polish.	Grey Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #79	03-825 Popper Site	483N 495E Level 7	Yes	Medium/Heavy polish, perpendicular and lateral striations, and pocking	Light polish with in the retouch itself	Light, Medium/Heavy polish, Lateral and perpendicular striations, pocking	Ventral	Dorsal	Ventral retouch edge	Ventral opposite margin	36.76	36.03	18.8	Cutting and Scraping	True retouch event no use within the retouch flakes itself. Heavy polishing most likely used as a scrapper.	Red Quartzite
Artifact #80	03-825 Popper Site	476N 500E Level 2	Yes	Perpendicular striations, light polish, and pocking	Light polish	Perpendicular striations, light polish, and pocking	Ventral	Dorsal	Ventral retouch edge	Dorsal retouch edge	46.21	32.45	14.64	Scraping motion	This piece is used post reworking	White quartzite
Artifact #81	03-825 Popper Site	486N 495E Level 2	Maybe	light polish	light polish	Light polish	Ventral	Dorsal	Na	Na	43.82	38.68	20.69	Na	This piece is incredibly lightly used if at all	White quartzite
Artifact #82	03-825 Popper Site	486N 495E Level 2	Yes	Light polish	light polish	Light polish	Ventral	Dorsal	Ventral retouch edge	Dorsal retouch edge	55.02	50.4	18.29	Na	This piece is very lightly used at best and has one instance of perpendicular and lateral striations appearing on the same high point in the topography	Grey Quarrrzite
Artifact #83	03-825 Popper Site	485N 498E Level 5	Yes	Light polish, lateral and perpendicular striations	light polish	Light polish, lateral and perpendicular striations	Dorsal surface	Ventral surface	Dorsal retouch side	Dorsal lateral margin	89.47	77.1	25.02	Scraping motion	This piece is interesting Light polish within the reworking episode which means the ventral side was modified and not used but the dorsal side was modified and used.	Grey Quarrrzite
Artifact #84	03-825 Popper Site	476N 498E Level 3	Yes	Medium polish, Lateral and perpendicular striations	Medium polish Lateral and perpendicular striations	Medium polish, lateral and perpendicular striations	Dorsal surface	Ventral surface	Dorsal Lateral margin	Other dorsal Lateral Margin	41.3	52.9	8.79	Scraping and cutting	Dorsal retouch episode with use within it. This flake was utilized then resharpened, and then re-utilized	White Quartzite
Artifact #85	03-825 Popper Site	476N 498E Level 3	Maybe	Na	Deep lateral striations	Deep lateral striations	Dorsal surface	Na	Dorsal end edge	Na	24.03	31.96	7.77	Cutting motion	This piece only exhibits dorsal lateral striations.	Red Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #86	03-825 Popper Site	476N 498E Level 3	Yes	Light polish	Lateral striations and light polish	Light polish and lateral striations	Ventral Surface	Dorsal Surface	Ventral lateral margin	Dorsal lateral margin	25.17	24.15	8	Cutting motion	This piece is lightly used and used in a cutting motion	White Quartzite
Artifact #87	03-825 Popper Site	478N 498E Level 4	Yes	Heavy polish, lateral and perpendicular striations, pocking,	Heavy polish, lateral striations, heavy edge damage	Heavy polish, lateral and perpendicular striations, pocking, and extreme edge wear	Ventral Surface	Dorsal Surface	Ventral Lateral margin	Other Ventral Lateral Margin	28.6	18.06	5.73	Scraping and cutting	This tool is heavily used on both surfaces this piece was used in both a cutting and a scraping motion	Purple quartzite
Artifact #88	03-825 Popper Site	478N 498E Level 4	Yes	Medium and Heavy polish, Lateral and perpendicular striations, and moderate edge damage	Medium polish, moderate edge damage	Medium and Heavy polish, perpendicular and lateral striations, and moderate edge damage	Ventral surface	Dorsal Surface	Ventral lateral margin	Dorsal lateral margin	35.96	18.53	5.26	Cutting and Scraping	This tool is very heavily used on both surfaces	Purple quartzite
Artifact #89	03-825 Popper Site	478N 498E Level 4	Yes	Heavy polish, perpendicular striations, pocking, and moderate edge damage	Heavy polish, perpendicular striations, pocking, and moderate edge damage	Heavy polish, perpendicular striations, pocking, and moderate edge damage	Ventral Surface	Dorsal Surface	Ventral "U" edge	Dorsal "Triangle of Use"	23.77	16.5	5.69	Scraping motion	Very heavily utilized flake, and used in a scraping motion despite it's small size.	Purple quartzite
Artifact #90	03-825 Popper Site	476N 498E Level 3	Yes	Heavy polish and pocking	Lateral striations, Pocking, and heavy polish	Heavy polish, pocking, and lateral striations	Ventral surface	Dorsal Surface	Ventral Triangle of use	Dorsal triangle of use	23.36	25.87	9.22	Cutting motion	Very heavily used in a cutting motion	White Quartz
Artifact #91	03-825 Popper Site	476N 498E Level 3	Yes	Lateral striations, Heavy polish, and pocking	Heavy polish, Lateral striations, and pocking	Heavy polish, lateral striations, and pocking	Ventral surface	Dorsal surface	Ventral front edge	Dorsal Front leading edge	16.31	22.01	5.26	Cutting motion	Very heavily used in a cutting motion	White Quartz
Artifact #92	03-825 Popper Site	476N 498E Level 3	Yes	Medium Polish	Medium polish and lateral striations	Medium polish and lateral striations	Dorsal surface	Ventral surface	Dorsal lateral margin	Ventral Lateral Margin	33.81	23.34	11.84	Cutting motion	Moderately well used flake used in a cutting motion and both sides show consistency of wear	White Quartz
Artifact #93	03-825 Popper site	486N 495E Level 5	Maybe	Very light sporadic polish	Very light sporadic polish	Very light sporadic polish	Na	Na	Na	Na	39.64	26.75	8.61	Na	This flake has indeterminant use	White Quartzite

Number Analyzed	Provenience	Unit/Level	Presence of use wear	Ventral Surface	Dorsal Surface	Type of Use wear/present	Primary Contact side	Secondary Contact side	Primary Use edge	Secondary Use edge	Length (mm)	Width (mm)	Thickness (mm)	Motion	Notes:	Material
Artifact #94	03-825 Poppoer Site	486N 495E Level 5	Yes	Light polish	Light polish	Light polish	Ventral surface	Dorsal surface	Ventral End margin	Dorsal End margin	21.25	43.86	5.98	Na	This flake is used just enough to be called used	White Quartzite
Artifact #95	03-825 Poppoer Site	486N 495E Level 5	Yes	Medium polish and pocking	Medium polish	Medium polish and pocking	Ventral surface	Dorsal Surface	Ventral lateral margin	Dorsal Lateral margin	45.27	26.68	9.53	Na	This flake is large enough to be used more but the signs of use are sporadic	White Quartzite
Artifact #96	03-825 Poppoer Site	486N 495E Level 3	No	Na	NA	Na	Na	Na	Na	Na	60.86	56.16	23.4	Na	This piece has reworking along the edge but it is not used	White Quartzite
Artifact #97	03-825 Poppoer Site	486N 495E Level 3	Yes	Na	Light polish	Light polish	Dorsal surface	Na	Dorsal Leading edge	NA	31.53	32.74	7.35	Na	This piece is solely used along the Dorsal surface and even then very lightly so	White Quartzite
Artifact #98	03-825 Poppoer Site	486N 495E Level 3	Yes	Light and Medium polish	Medium polish	Light and medium polish, lateral striations	Ventral surface	Dorsal surface	Ventral lateral margin	Other dorsal Lateral Margin	48.89	51.51	6.98	Na	This flake has dorsal retouch with use within the retouch	Purple quartzite
Artifact #99	03-825 Poppoer Site	476N 502E Level 2	Yes	Light to Medium polish, Lateral striations	Light/Medium polish and lateral striations	Light and medium polish, lateral striations	Ventral surface	Dorsal surface	Ventral retouch edge	Dorsal retouch edge	64.34	57.96	19.06	Cutting motion	This flake is lightly used on the Dorsal surface where there is extensive retouch with use within it. This is possible to the retouch and odd angles within the retouch.	Grey Quartzite
Artifact #100	03-825 Poppoer Site	478N 498E Level 4	Yes	Light polish	Light Polish	Light Polish	Ventral surface	Dorsal Surface	Ventral leading edge	Dorsal leading edge	38.97	20.86	9.34	Na	This tool is very lightly used	White Quartzite

APPENDIX B: RAW DATA

03-1056 Duck Lake Site

Artifact #1

Duck lake site 494N 498E Level 2 utilized flake bag 7 Artifact #7

Negative test edge shows clear signs of macroscopic reworking but upon review at 50x magnification no signs of Use wear appeared at all on either side ventral or dorsal

03-1056

Artifact #2

Duck lake site 494N 498E level2 cat 2c utilized flake bag 7 artifact2 7-10-09 DF, JG

Ventral surface

Mostly striations and medium polish occur on this side of the piece.

Dorsal surface

Polish, Striations (lateral), and macroscopic edge damage

Analysis

This piece was used for an undeterminate time at this point but it is very much used.

Artifact #3

494N 498E level 2 cat 2c 7-10-09 DF, JG Bag 7

Extremely positive test there is extreme polish that occurs along the entire edge of the flake. Striations appear (lateral), as well as extreme edge damage along the flake.

Artifact #4

494N 498E quartzite flake cat 2c level 4c bag 130

Ventral surface:

Heavy polish throughout the ventral surface . Extreme signs of edge damage, some striations throughout heavy polish. All margins along all sides, including polish going into the center I followed it all the way into the center of the flake from the edge of the tool.

Dorsal surface:

Polish all over this side as well. Polish is noticeably less but it leads all the way to the flake scar that was taken from the center of the tool. This scar creates a slope on the dorsal surface noticeable increase in striations on this side of the flake but slight decrease in polish along this side.

Analysis:

Perhaps this is due to the retouch then reuse that was done on the dorsal side of the tool. The tool was created utilized then resharpened by taking that flake from the dorsal surface and then used which accounts for the use along the flake scar edge. All lateral margins have use including the North/ South edges the flat sides also have polish on them as well. The Ventral surface is the primary contact edge and the dorsal surface is the surface that is most heavily modified.

Test #5

494N 498E Level 4c utilized flake NM, JG, AM 7APU cat 2c Bag 130

Ventral:

Light Polish and significant striations appear through this flake (both lateral and perpendicular) striations. Polish extends largely into the flake on this side indicating a large use and a deep cutting exercise along the Ventral surface that is the primary use edge.

Dorsal:

Less striations and modification on this side than the ventral surface with less polish and striations. Same leading edge based on the concentration of use on the leading edge.

Analysis:

All edges of the tool show signs of use. This is quite interesting, the ventral surface shows the most signs of use. As well as the extreme back of the blunt side of the flake which is a possible indicator of hand wear. Medium/heavy polish indicates a use episode that is extensive on a soft material.

Test #6

409N 500E Level 6 bag 137 7APU utilized flake

Ventral surface:

Heavily striated more so than the dorsal surface, polish along all the edges of the tool Medium/Heavy allows for utilization of all edges on this side of the tool. Pocking, striations, and edge damage all occur along this side of the flake. Most heavily used area is along the forward triangle.

Dorsal surface:

Polish all over this side of the flake though it doesn't extend all over the face of the flake. Not extensive edge damage but noticeable utilization along the triangle but macro and micro signs of wear appear here. Polish and striations additionally appear on this side of the tool.

Analysis:

The ventral surface shows the most wear and the most useable edges. That having been said the primary use of the flake is centered around the triangle. Medium/Heavy polish, striations (perpendicular) pocking and rounding of the edges all occur along the edges of this flake. Most definitely heavily utilized as a scrapper.

Flake #7

498N 502E bag 60 level 3 2c 2AP

Ventral surface:

Two worked edges appear one utilized as a scrapper and one utilized as a cutting edge. The scrapper edge is the most worked on the entire tool face. Pocking, perpendicular striations, and medium/heavy polish occur. Several flakes are missing from this edge as well either from use or from modification. Though use occurs on the flake scars so most likely a retouch episode. The cutting edge is lightly used with light polish and light scratches moving parallel to the blade edge.

Dorsal surface:

Limited polish, striations and a large flake scar that exhibits Use wear as well.

Analysis:

This piece has been utilized on two edges though only on the ventral surface a scapping edge and a cutting edge. The dorsal surface only exhibits and a scapping edge. The ventral surface only exhibits a cutting edge and has only a light polish. The cutting edges show a light polish and limited striations. The scapping edge shows heavy polish, pocking, and striations. The ventral surface is the primary contact surface for this flake.

Flake #8

498N 502E bag 60 artifact 3 2c Level 3

Ventral:

Significantly more Use wear along the ventral surface rather than the dorsal surface. Limited edge damage but noticeable both macro and micro signs of use along the edge. Light polish is the only sign of microscopic use on this side other than the edge attrition.

Dorsal:

Light signs of use throughout the use edge of the tool. Very sporadic and extremely light polish throughout the blade edge. Use does increase towards the end of the flake.

Analysis:

The ventral surface is the primary contact surface for this flake and is much more utilized than the dorsal side. The tool has sporadic light polish, and no striations, pocking, or excessive edge damage.

Flake #9

494N 498E Level 2 bag #7

Ventral surface:

Significant polish, limited striations, small amounts of pocking, and significant edge damage along the edges of the tool. Use edges along the entire dorsal surface.

Dorsal surface:

Pocking, polish, and edgewear all occur along the edge though less than the ventral surface and fairly limited in nature. Pocking occurs as well on this side and could be indicative of graving.

Analysis:

The pocking occurs only along the possible graving edge of the tool. The polish and the edge damage occur throughout the rest of the utilization of the tool. The pocking is deep and the polish is heavy. Indicating heavy use of the tool, though limited to no retouch suggests a one time use of the tool.

Flake #10

494N 498E Level 4a 2c quartzite flake 7/16/2009 Df, JG 3 ARU bag 93

Ventral surface:

Extremely limited signs of use very very limited just enough signs to call it used on this side, extremely limited edge wear and very limited light polish.

Dorsal surface:

Very light signs of use, light polish throughout this side, limited striations, little to no edge damage. Again just enough to be categorized as microscopically used.

Analysis:

This flake has very limited signs of use but mainly on the dorsal surface lateral margin.

Flake #11

495N 500E Level 4 7/18/2009 bag 191

Ventral surface:

Not cortical side all edges utilized pocking edgewear, lateral and perpendicular striations, and medium polish exists here as well.

Dorsal surface:

Polish mainly, but striations heavily dispersed though the breaks in the cortex on this side otherwise the cortex hides the signs of use that normally would have been present.

Analysis:

The non cortical side shows signs of utilization on all possible surfaces that can possibly be used. The cortical side only shows one side that can be used and is used. Heavy edge modification on this tool, heavy utilization despite its size more than likely a cutting tool.

Artifact #12

494N 498E 2C quartzite flake 7/14/09 Bag 37 DF/JG 3AU

Ventral surface:

Super good evidence of polish (light/medium) striations lateral, and pocking. This ventral surface is very heavily used!

Dorsal surface:

Polish, striations, moderate edge damage and pocking along the most used edge.

Analysis:

Polish, striations, pocking and edge damage were kept to a minimum along the dorsal surface. Ventral surface shows significantly more signs of wear as per the trending patten with colored quartzite on Grand Island. Limited edge damage signifies less use time, heavy striations, polish, and pocking however. Overall well utilized flake and well used flake that is a good size of good material. Ventral surface is the main contact surface.

Artifact #13

498N 504E Level 7 2c quartzite 7/30/09 EH/JG bag# 158

Ventral:

Striations, polish, and excessive damage along the use edge. This flake though small is incredibly used and excessively so.

Dorsal: No Use wear on the cortex but excessive Use wear on the quartzite interior that appears on the interior of the flake. Massive use polish, pocking, striations, and large amounts of edge damage.

Analysis:

This flake though small is quite heavily used along the lateral margins, pocking, polish, striations, and extreme edge wear all appear along these things. This is a very well used flake and a tool that shows no wear along the cortex. This piece appears to have broken off and then continues to be repurposed and reused.

Artifact #14

501N 501E level 6 2c utilized flake TM, Ab bag 106

Ventral surface:

Striations, pocking, polish, and limited edge wear. This side of the tool has limited edge wear but extensive signs of use wear.

Dorsal surface:

Scratches, striations, definitive use edge along the lateral margins clear and present use edges along the edges.

Analysis:

This flake continues the trend of flakes that are very heavily used and colored. The purple and red ones are much heavily utilized over the clear white ones they are more worked as well. This flake is bipolar and has additional flakes taken off the blade edge in a resharpening episode the ventral surface is more heavily utilized than the dorsal surface as per the usual.

Artifact #15

501N 501E level 6 2c utilized flakes TM, AB bag 106

Ventral surface:

The lighter side that is used is the ventral side, light polish, pocking, and light edge damage.

Dorsal surface:

Polish, striations lateral and perpendicular, light/medium polish, pocking, and edge wear along the edge of the use edges.

Analysis:

These edges are quite used. The vertical striations that appear on the dorsal surface appear vertical which is different and the opposite that the flake scars are. This is quite well used and very well used and the striations are more than likely scratches, the polishes do not appear as well on this piece. I think this piece moved in a scrapping motion.

Artifact #16

501N 501E Level 6 2c utilized flake TM, AB bag 106

Ventral:

Lightly polished, some signs of use along the primary use edge in terms of edge attrition. This flake is perhaps leftovers from a resharpening episode.

Dorsal:

Polish most heavily occurs along the primary use edge of the flake as well as the most edge damage.

Analysis:

This piece is a retouch flake. The ventral surface showing less signs of use is congruent with the hypothesis that the dorsal surface would be the most used and then left over from a tool resharpening episode.

Artifact #17

498N 504E level 6 7/28/09 cat# 2c

Ventral:

The ventral surface has light striations, some polish, edge damage along the lateral margins, and light pocking.

Dorsal:

The lateral margins are the most used. The lateral margins have pocking, medium polish, and heavy edge wear.

Analysis:

The lateral margins had the most significant signs of use though pocking, polish, striations (lateral) and edge damage seem to appear all the way through the flake.

Artifact: 18

494N 498E level 4b cat 2c flake 7-22-09 DF, JG

Ventral surface:

Striations polish, pocking and limited edge wear all appear on this flake.

Dorsal surface:

Striations, polish, pocking, and extensive wedge wear all appear along the primary edge in this side. Though it is important to note that this only appears on the parts of the flakes that don't have cortex visible.

Analysis:

The flake all in all is very heavily used. Polish, pocking, striations, and extensive edge damage all appear on this flake. The wear seems to be evenly distributed throughout the sides and surfaces of the flakes.

Artifact #19

494N 498E level 4b cat: 2c Flake quartzite 7-22-09 Df, JG bag 87 2APA

Ventral

Extreme polish, striations (lateral and perpendicular) pocking, and edge damage along the main use area otherwise moderate polishing occurs on all edges of this piece.

Dorsal

Significantly less signs of use on this edge than on the other edge of the tool. That having been said all edges of this tool have signs of use extensive edgewear and polish and light striations occur on this piece.

Analysis:

The ventral surface as with the other pieces is the leading edge and the leading edge is massively used. This is a cutting tool most likely meat production. Massive use the most used piece that has thus far been analyzed.

Artifact: 20

494N 498E level 4b cat: 2c flake quartzite 7-22-09 DF, JG 3FPU

Ventral:

Main use edge has extensive dark polish that extends into the low points so the blade attrition is very high. Striations appear perpendicular to the blade at between a 75-90 degree angle with the extensive edge damage has parallel striations to the blade edge polish is there but not as intense as on the primary use edge and it is brighter and much more limited to the high points of the topography. Edge damage is extensive as well though less modification on this edge.

Dorsal:

The flake on this side is very lightly used. Indicating a very heavy use on the ventral surface with is counterintuitive to the modifications on this tool, unless this tool was modified and then extensively re used which is the purpose of retouch.

Analysis:

The ventral side is by far the most heavily use side of the tool and is most likely the primary contact edge. The primary use edge was used in a scrapping motion on a soft surface the secondary surface is used in a cutting motion also on a soft surface most likely ventral surface contains the primary use edge on the ventral surface and the secondary use edge is less used than the primary. Both lateral margins show extreme signs of use primarily on the ventral surface.

Artifact #21

501N 501E bag 113 level 5 quartzite flake EH, TM 2c 7/22/09

Ventral:

Striations perpendicular to the blade edge, medium/light polish and extreme edgewear.

Dorsal:

Most of this side is heat treated and cortex so the signs of wear do not appear readily or at all on this type of surface.

Analysis:

The ventral surface shows the most significant signs of use on this flake and is the primary contact side. Striations running perpendicular to the blade edge along with polish extensively along the ridge tops (medium) the dorsal surface has massive pocking but that maybe from the heat treatment and or the remnants of the cortex. Otherwise very well used flake.

Artifact #22

501N 501E Level 5 quartzite flake Eh, TM 2c 7/22/09

Ventral surface

Some use on all edges of this flake. Striations, light polish, for most of the tool but the secondary use edge has extensive polish that accrues on the valleys of the topography as well.

Dorsal surface:

The dorsal surface is 99% cortex Use wear doesn't appear on these types of surfaces.

Analysis:

This flake has extensive polish along the secondary use edge and striations, light/medium polish along the primary use edge of this flake. True to form the ventral surfaces are by far the most used though the dorsal surface is the side that is entirely made of cortex so it wouldn't show signs of use anyway. Primary use edge used laterally and secondary use edge is undetermined.

Artifact #23

498N 502E level 4b utilized flake cat 2c 7-24-09 bag 209 JH, LF

Ventral:

There is edgewear on two of three sides of this piece but it is light and doesn't have a lot of variety. There is macroscopic edge damage and light polish that is concurrent with the use on the dorsal surface.

Dorsal surface:

Dorsal surface is primarily cortex and the heat treating disturbs, distorts, and camouflages the majority of the signs of use on this edge. There is extensive macroscopic signs of use on this piece and light polish where the cortex seems to have pulled back. Edge damage and polish on the tops of the topography are the only signs of use on this side.

Analysis:

The fact that is FCR definitely distorts signs of use. Macroscopically this flake is heavily rounded on the edges but microscopically there is only polish and very light signs of use. I'm not sure how this was used other than it was utilized.

Artifact #24

495N 500E Level 5 cat #2c quartzite flake 7-23-09 DF, PR bag #158

Ventral:

Primary use edge is right along the front edge though there are limited signs of use along the entire flake. It is edgewear light, polish, and extremely limited striations.

Dorsal:

There are signs of polish, along this edge. This piece is a scrapper based on the morphology of the flake extreme attrition along the blade edge leading to light polish on top of the stratigraphy in the flake itself. This piece is utilized though only enough to be called so.

Analysis:

The most signs of use come where they are expected along the scrapper edge. That having been said there are very few signs of use only light polish on top of the topography and edge wear. Very lightly used scrapper.

Artifact #25

498N 502E level 4b utilized flake cat 2c 7-24-09 bag 209 JH, LF

Ventral:

The ventral surface shows medium signs of polish and is excessively used. They are large striations that run perpendicular to the primary blade edge running throughout the topography variants in several areas of the flake. Edge wear both occurs micro and macroscopically on the edges, polish striations and pocking all occur along the main use edge. Used in a scrapping motion evidenced by deep striations.

Dorsal:

The dorsal surface is still primarily cortex with the sole exception of the secondary use edge. These signs of use include striations, light polish, and extremely light pocking. These are congruent with scrapping as the lines of striations run perpendicular to the blade edge.

Analysis:

The primary use edge shows heavy signs of use along the ventral surface the dorsal surface is hidden with cortex. The secondary use edge appears on the dorsal surface and the lighter signs of use appear on the ventral surface on this piece. The piece was used then flipped and use in the same/similar task again based on the evenness of the wear.

Artifact #26

498N 502E level 4b utilized flake cat: 2c 7-24-09 bag 209 JH, LF

Ventral

There are light signs of use on this piece light polish, light edge damage, and one instance of pocking all occur on this side of the tool. This piece is very lightly used by the maker of the actual quartzite itself seems to obscure some of the signs of wear.

Dorsal surface:

The dorsal surface is lightly used. Light polish and a little edgewear. Limited signs of use on this piece all in all is very light and just enough to be called used.

Analysis:

These signs of use occur along two edges though they are incredibly light. Polish is light and the dorsal surface has a blade like flake scar on it. The surface of material is very fragmented and could hide signs of use. Also there are multiple crystalline impurities in this piece this is the worst quality material thus yet analyzed.

Artifact #27

498N 504E level 6 2c quartzite 7-28-09 bag 132 6AP

Ventral:

Medium polish, pocking. Lateral striations, rounding off of the microtopography and extreme edge wear. This piece is incredibly used. The ventral surface shows signs of being used as a cutting tool for a substantial amount of time based on the level of attrition on the flake microtopography and amount of use wear on this piece.

Dorsal:

The dorsal surface has significant signs of use wear in partly covered up by the cortex. The cortex is disturbing the true signs of wear but non cortical parts have extensive edge damage, polish of light and medium build up, striations, and light pocking.

Analysis:

The ventral surface is by far the most extensively used side on this flake. Medium polish that has started to stream roll over the microtopography along the striations if appears this piece was used as a meat cutter.

Artifact #28

498N 502E level 4b utilized flake cat 2c 7-24-09 bag 209 JH, LF

Ventral:

Lateral striations, pocking, light polish and extensive edge damage these signs of occur evenly throughout this side of the piece. This flake has been in at least a cutting motion based on the lateral striations.

Dorsal:

Polish, perpendicular striations and massive edge damage. There are mixed signs of wear throughout this side of the tool. Light medium signs of use on this flake they are on top of the stratigraphy and have started to roll over the flake scars in some spots.

Analysis:

The dorsal surface has perpendicular striations running along it and the ventral surface (heavily modified) has lateral striations running along it. Evidence for a scrapping motion and a cutting motion exist. The signs of wear are evenly distributed throughout the flake on both sides.

Artifact #29

498N 502E level 4b utilized flake cat 2c 7-24-09 bag 209 JH, LF

Ventral surface

Moderate edge attrition, light polish, and light scratches in the polish are the signs of use on this side of the tool. This piece is very lightly and just barely used. Not enough evidence for a primary use edge just light and incredibly sporadic use throughout.

Dorsal:

The dorsal surface is mostly cortex but that having been said there's very little signs of use on the non cortical areas. Extremely light polish, limited edgewear, round out the signs of use on this side.

Analysis:

This piece is incredibly small and bears very light signs of use on both the cortical side and ventral side there are very limited signs of use on both surfaces. Very lightly used just enough to be call used no primary use edge that could be determined.

Artifact #30

498N 502E level 4b bag 207b 2BP 7-23-09 JH, LF

Ventral:

Polish, pocking, striations, and edge wear occur on both the primary and the secondary blade edges. Though the concentration of the polish is much more heavily dense on the primary blade

edge. Lateral striations continue to occur parallel to the blade edge congruent with the dorsal surface. The ventral surface is much more heavily used than the dorsal surface.

Dorsal:

Striations, pocking, polish, and edgewear all appear en masse on this flake. The striations are moving in a lateral manner parallel to the blade edge. As usual the dorsal surface shows less signs of wear than the ventral surface and the cortex completely distorts the signs of use on that edge of the flake surface.

Analysis:

This piece was used in a parallel cutting motion as evidenced by the lateral parallel striation found on both blade edges. Heavily used on the ventral surface this flake of quartz shows extreme use similar to blades found in other assemblages.

Artifact #31

495N 500E level 5 cat #2c quartzite flake 7-23-09 DF, PR Bag #158

Analysis:

Thermally modified, red quartzite biface. This tool was not used in my opinion as well as Logan's. These thermally modified tools do not show signs of use very well both sides are heavy with cortex and though of better quality quartzite the tool does not show signs of use in any manner. This is the distal end of the tool brilliant pressure flaking though.

Artifact# 32

498N 502E Level 4b bag 207B 2BP 7-23-09 JH, LF

Ventral:

polish, pocking, vertical/lateral striations along multiple use edges. The ventral side of the tool has no cortex and much more use. Medium signs of polish along both use edges.

Dorsal:

Polish, pocking, striations and edge damage. The polish is light to medium and doesn't completely roll over the topography of the microstratigraphy. This side is splotted with cortex and may have hurt the ability of use to accrue.

Analysis:

Light to medium use on both sides of the tool as told by the polish accrual. The primary use edge is the lateral margin and the secondary use edge is on the distal end that comes to a point. Used in a cutting motion on both edges evidenced by the striations and polish.

Artifact #33

498N 502E Cat 2b quartz flake 2b 7-23-09 Jh Lf Level 4b

Ventral:

Extensive signs of polish, striations abound, as does pocking. Certain that based on the extensive wear that this piece is a scrapper.

Dorsal:

Massive signs of wear, polish, striations, and pocking that occurs along the same edge as the ventral surface. Extensive signs of wear and of use on soft material.

Analysis:

Massively used flake use as a scrapper based on the massive amounts of polish and the signs of wear on the leading use edge. Still true to form this piece exhibits the most signs of wear on the ventral surface. Heavy use!

Artifact #34

498N 502E utilized flake cat: 2c 7-24-09 JH, LF 7APU Bag #209

Ventral:

Heavily utilized along the primary use edge with light polish, lateral striations, and edge damage. Distinct signs of use in a lateral motion.

Dorsal:

The heavily cortical dorsal edges show no signs of use but the edge that is modified has polish, pocking, and striations along the primary use edge.

Analysis:

This tool is heavily cortexed on the dorsal side but the modified side is still very used in accordance to the ventral surface. Light polish, lateral striations, and edge wear appear en masse on both edges this tool is a cutting tool.

Artifact #35

498N 504E Level 7 2b quartz 7/30/09 EH, JG bag# 168 6BP

Ventral:

Heavy signs of use heavy polish lateral and perpendicular striations, pocking, and extreme edge wear. Possible haft very well used on all edges.

Dorsal:

This side is complete cortex and no signs of wear exist.

Analysis:

This flake was very heavily used as a cutting tool in both perpendicular and lateral motions. All sides on the ventral surface show extreme signs of use and perhaps hafting scars. Very well used piece the dorsal surface doesn't show any wear due to the cortex.

Artifact #36

495N 500E 7/15/09 level 3 cat 2c PR, JG Bag 55

Ventral:

Sporadic polish throughout the flake but mostly along the primary use edge.

Dorsal:

Light wear just enough to say its used extremely sporadic light polish heavy cortex/thermal modification that disguises the signs of wear very sugary texture.

Analysis:

This tool is used very lightly and sporadically. Just enough to say it's used. Light polish that's sporadically spattered throughout the primary use edge. Heavy thermal modification/ impurities make the tool difficult to analyze but still largely used lightly.

Artifact #37

494N 498E cat 2c 7-14-09 DF, JG level 3 bag 34 utilized flake 6APU

Ventral surface:

Medium polish and edge damage no evidence for striations that appear over the microstratigraphy light to no use other than the primary use edge.

Dorsal:

medium polish and edge damage are the signs of use on this flake and the use is congruent to the form/function of the flake.

Analysis:

The ventral surface shows more consistent signs of polish and the edge damage than the dorsal but both have medium polish. Medium polish is an intermittent disruption of the flake scars on the microstratigraphy of the quartzite itself. This medium wear/ polish appear exactly where one would expect on this tool. Use is indeterminate as to what it was used for.

Artifact #38

Unprovenienced 2AP

Ventral: light to medium sporadic polish on the ventral surface as well as a little edge damage.

Dorsal: Medium polish en masse and striations appear along the primary use edge of this piece. It is quite heavily used especially for its size.

Analysis:

The ventral surface shows significantly less use than the dorsal surface does. This is odd considering it's a ventral surface and they show more signs of wear usually. Light/medium polish occurs and some edge damage. This flake could have been used as a tool upside down or as a thinning flake or part of a resharpening episode.

Artifact # 39

Unprovenienced 2APH

Ventral:

This surface is very lightly and sporadically used. Light polish is spread sporadically on this side of the tool. Sporadic and inconsistent lateral striations appear just in the individual flake scars. There is an odd amount of flattened topography not in a polish or use sense but like the ventral surface is just flatter than normal.

Dorsal:

Medium polish throughout the entire surface of the tool to the point that I can't determine a primary use edge. This piece is heavily used but not to maximum attrition used in a perpendicular scraping motion.

Analysis:

The dorsal surface is extremely utilized not able to determine a primary or secondary use edge the ventral surface is sporadically used so little I'm hesitant to say it's utilized this dorsal surface is extremely used. Not following the normal pattern at all. Either this flake was used upside down or this is a thinning or resharpening flake.

Artifact #40

494N 498E level 4a 2c 7-16-09 6AP DF, JG Bag 93

Ventral:

This side is much more utilized than the dorsal surface. Light polish pocking, and edge wear are all present in this side of the flake.

Dorsal:

Very light and sporadic signs of use due to the significant amount of cortex. That appears on this side of the flake.

Analysis:

The ventral surface that is on this side of the flake is the most heavily used side on this piece. Light polish, pocking, and edge damage wear all occur on this piece. Dorsal surface shows extremely limited signs of use due to the cortex that is on it.

Artifact #41

Unprovenienced

Ventral:

This tool is used on all sides with consistent light polish occurring on all edges of this side as well as edge damage. This tool is used, though this side of the flake has multiple flakes taken off of it.

Dorsal:

Sporadic medium polish, pocking, and edge damage all occurring on this side of the tool. 50% of this side of the tool showing of wear whereas the other side of it is a cortical nightmare showing no signs of wear.

Analysis:

This tool is very heavily used flake though the dorsal surface shows the most kind of wear. The ventral surface is heavily modified with multiple flakes having been taken off of the surface in

perhaps a resharpening episode. This flake doesn't fit the pattern either ventral wear has been distorted by retouch or the dorsal surface was always the leading edge of the tool.

Artifact #42

494N 498E level 4a 2c 7-16-09 2APH DF, JG Bag 93

Ventral:

Heavy signs of use through out the edge of the tool. Light/Medium polish occur on this side of the tool. Some lateral striations occur and significant edge damage. Heavily used tool form.

Dorsal:

Heavy signs of use continuous signs of use on all sides. This flake contains heavy use. Lateral striations occur on the blade edge but perpendicular striations to the blade edge occur along the side margins. Pocking, and edge wear all occur as well along the blade edges.

Analysis:

This tool is heavily used on all accounts medium polish throughout. Lateral striations on the blade edge the ventral surface is utilized more heavily and the leading contact side. Edge damage is a lot. Another expedient tool heavily used.

Artifact #43

494N 498E Level 4a 2c 7-16-09 2APH DF, JG bag 93

Ventral:

Light polish, edge damage, and limited striations that are parallel to the blade edge. Small flake with moderate signs of use.

Dorsal:

Light to medium polish, striations, and edge wear heavy signs of use on all the sides of the flake.

Analysis:

This flake has much more use on the dorsal surface with the ventral surface. Though the ventral has large signs of wear. The ventral surface has light wear whereas the dorsal surface has medium polish. Heavily used flake on both sides for its size it could be a retouch/resharpening flake due to the large dorsal wear but it could also be a tool outright with the leading edge as the dorsal surface.

Artifact #44

498N 502E Level 4b bag 104 cat 2b quartz flake 7-23-09 JH, LF

Ventral:

Medium polish, perpendicular striations, use signs over the entire edge of the surface, and edge damage. Used in a lateral scraping motion at least very heavily used side.

Dorsal:

Pocking, polish, light-medium edge damage. I'm unable to determine primary use edges on this side due to the consistency of use on all edges.

Analysis:

This flake by all accounts is very heavily utilized on both sides. The ventral side is the most heavily utilized and I believe it is the contact side with the material. Striations indicate that at least it was utilized in a perpendicular motion indicative of use as a scrapper.

Artifact #45

498N 502E 2c bag 104D level 4b JH, LF

Ventral:

Light medium polish, edge modification on the tool, striations running perpendicular to the primary use edge, and some edge damage. Very heavily used for the size of the flake.

Dorsal:

100% cortex no signs of use present due to cortex.

Analysis:

This tool is heavily utilized due to the light-medium polish that occurs, perpendicular striations on the primary blade edge, the edges are all reworked, and heavily damaged. This tool was heavily used at least as a scrapper and the ventral surface as the contact side.

Artifact #46

498N 502E level 4b cat 2b quartz flake 7-23-09 JH, LF 10BPR

Ventral:

Edge passed maximum attrition heavy polish, striations on the perpendicular to the blade edge, pocking, and extreme edge damage.

Dorsal:

Heavy polish, pocking, striations, edge damage. This side of the flake was used in a perpendicular scrapping motion due to the striations that occur perpendicular to the blade edge.

Analysis:

This flake was used passed primary attrition. Evidenced by the heavy polish, perpendicular striations, pocking, and edge damage. Both sides were heavily used with the ventral side being that much more heavily used side of the scrapper.

Artifact #47

494N 498E level 4a 2c 7-16-09 6AP DF, JG Bag 93

Ventral:

Light signs of wear appear throughout this side of the tool. Light polish is consistently found on all sides of the tool as does edge wear and reworking.

Dorsal:

100% cortex I'm unable to determine the signs of wear on this die due to heavy amounts of cortex. It does appear that this side of the flake was modified.

Analysis:

The ventral surface is the only one that shows use as the dorsal surface is totally cortex. Light polish, edge damage, and rework appear constantly throughout all sides of the flake. The ventral surface is most likely the contact side.

Artifact #48

494N 498E level 4a 2c 7-16-09 6AP DF, JG bag 93

Ventral:

Light polish throughout this tool on all sides. I can't determine the primary use edge due to the light polish, edge damage, and limited sings of use on all sides. This side of the tool is quite lightly used.

Dorsal:

Extremely minimal signs of use light polish along the leading edge 75% is cortex on this side very light polish and light use.

Analysis:

Extremely light but consistent signs of use on the ventral surface. The dorsal surface though 70% cortex is the edge I was able to determine the most useful information on the leading edge. Once again the ventral surface is the contact surface.

Artifact #49

Ventral:

Light signs of use once again throughout this flake. The ventral surface is used on the majority of the surface. Light polish, light edgewear and light signs of use. This piece is thermally modified so that disturbs some signs of wear.

Dorsal:

This side of the flake is quite a bit more heavily used than the other side is. Medium polish, pocking, and edge damage occurs on this side of the leading edge.

Analysis:

The ventral surface is quite lightly used. Whereas the dorsal surface is much more heavily used. Light signs of use concealed by thermal modification on the ventral surface and the dorsal is the heavy contact side.

Artifact #50

494N 498E level 4a 2c 7-16-09 6AP, DF, JG bag 93

Ventral :

This flake is moderate use on it. Medium wear and striations, edge damage all occur on this flake. Striations run lateral to the primary use edge.

Dorsal:

Lateral and perpendicular striations medium/heavy polish, pocking, edge wear all occur on this flake. Massively used flake primary contact side through both are used.

Analysis:

The ventral surface is the lesser used side on this flake. Both sides have lateral striations to the primary use edge but the Dorsal side has significantly more signs of wear. The dorsal surface contains both lateral and perpendicular striations. This flake's primary use side is the dorsal side. Very well used.

Artifact #51

494N 498E Level 4a 2c 7-16-09 7AP DF, JG Bag 93

Ventral:

Light polish sporadic throughout the side, little to no edge wear and some dorsal retouch not very well used.

Dorsal:

Limited signs of wear only in the flake scars most of this edge is cortex 80%. The parts that aren't are lightly used with light polish and light edge damage.

Analysis:

This flake is just barely used at all. Light polish and limited edge wear occur all over the ventral surface but very sporadic. The dorsal surface has two flakes taken out of it. But the ventral surface has the most wear and is the contact side.

Artifact# 52

494N 498E level 4a 2c 7-16-09 7AP Df, JG Bag 93

Ventral:

Perpendicular striations to the primary use edge, pocking, light/medium polish, and moderate edgewear on this flake is very well used.

Dorsal:

Medium-heavy polish, pocking, edge damage, striations both lateral and perpendicular to both primary and secondary use edges, and an extreme amount of wear.

Analysis:

The ventral surface shows significant signs of wear light-medium polish and the dorsal surface shows the most and is the primary contact edge. Extremely well used flake all signs of use appear. Both sides use in a perpendicular motion and the dorsal used in a lateral motion as well. Dorsal surface is the most used! Very heavily utilized flake.

Artifact #53

494N 498E level 4a 2c 7-16-099 7AP DF, JG Bag 93

Ventral:

Heavy evidence for consistent light use on this flake. Light polish, little pocking, and light edge damage.

Dorsal:

Light wear less than the ventral surface. Light polish in the area outside the flake scar the flake most likely done post use as the area around the scar is clean for signs of wear.

Analysis:

The ventral side was the most heavily used side though it shows little wear. Light polish is sporadic throughout but it is most concentrated along the ventral surface primary used edge. The dorsal surface shows customarily less wear though there is a giant flake taken from the dorsal surface post use as the flake scar is clean. Ventral surface is the leading edge. Very light use.

Artifact#54

494N 498E level 4b 2c 7-22-09 3AP DF, JG Bag 87

Ventral:

Still light signs of wear on this tool there is a flake scar that is on this side of the tool. The scar does exhibit signs of wear so it was used after the flake was taken off. Light polish, edge damage, and lateral striations appear on the end though they could be due to the dorsal primary use edge picture #4

Dorsal:

Very light signs of wear light polish and faint perpendicular striations to the primary use edge.

Analysis:

Different sides of the tool have different primary use edges these tools are quite lightly but consistently used. The tool is utilized by light polish, either perpendicular or lateral striations on both sides of the tool, and consistent edge wear

Artifact #55

494N 498E level 4b 2c 7-16-09 3APH DF, JG bag 87 (Biface)

Side:1

Light-medium polish consistently on this tool. Lateral striations on most surfaces, pocking, edge wear, very well used flake. Multiple flakes taken off of the edge with use on the flake scar.

Side:2

Extremely heavy use. Medium-heavy polish occurs on all sides of the tool. Pocking medium heavy polish, extreme edge wear, and lateral striations on multiple surfaces. There are several flake scars on this side and they all exhibit heavy signs of wear.

Analysis:

This was a tool that was made and then lightly used and discarded.

Artifact #57

492N 496.5E level 5 2b quartz 7-20-09 JH, SD bag# 167 10BP

Ventral:

This flake is heavily used extremely constant amounts of heavy polish, pocking, and very deep perpendicular and lateral striations.

Dorsal:

90% cortex so wear doesn't appear but the parts without cortex exhibit the same signs of wear in the dorsal as the ventral.

Analysis:

This flake was used in a perpendicular scarping motion and done so for a while, the wear is massive. Heavy polish deep striations both perpendicular and lateral (could be the same this occurs on a corner), an pocking, significant edge wear. Very well used flake!

Artifact #58

492N 496.5E level 5 2b quartz 7-20-09 JH, SD bag# 167 10BP

Side: 1

Medium polish, striations parallel to the blade edge and moderate edge wear.

Side:2

This flake is also heavily used the first side is the primary contact edge but this has medium polish, pocking, and moderate edge wear.

Analysis:

This flake is moderately used on both sides. Medium polish, pocking, deep striations lateral to the blade edge and edge damage all occur here. This was used in a cutting motion on side 1 is the primary contact side.

Artifact #59

492N 496.5E level 5 2b quartzite 7-20-09 JH, SD bag#167 10BP

Ventral:

This side is extensively used polish, pocking, deep perpendicular striations to the blade edge. Heavy polish and significant edge damage. The ventral surface is the primary use side.

Dorsal:

Light use, sporadic along the entire tool edge lateral striations. Light/medium polish along the surface of the tool, light pocking as well.

Analysis:

This tool is used as a scraper with the ventral surface as the contact side. Perpendicular striations, heavy polish, and significant edge damage all appear to prove this theory.

Artifact #60

492N 496.5E level 5 2b quartz 7-20-09 JH, SD bag#167 10B

Ventral:

Light polish, lateral striations/perpendicular to the edges picture #2 edge damage. Consistent signs of use along all sides of the tool blade edges.

Dorsal: light signs of use, some striations appear on differing sides of the blade and then the polish is consistent but light.

Analysis:

Light polish and deep striations consistent throughout the tool on both sides. I'm not sure they are using something so small.

Artifact #61

492N 496.5E Level 7 7-29-09 RWB, SD 2BU 2c bag 214

Ventral:

This side has pocking, medium wear, striations, both perpendicular and later, as well as the atrophy along the blade edge is moderate. Consistent signs of wear along all edges of the tool.

Dorsal:

Consistent and constant medium polish, edge attrition, pocking, and very deep both lateral and perpendicular striations. Very well used flake dorsal surface is the most used side and is considered the contact side.

Analysis:

The dorsal surface has more wear on it. Consistent medium polish, pocking, deep lateral and perpendicular striations and moderate edge attrition. These sides have been used in cutting and scraping motions. Dorsal surfaces use is consistent with the idea that it is a thinning or resharpening flake but the ventral wear suggests that it is a utilized tool that's primary contact side is the dorsal edge.

Artifact #62

492N 496.5E level 7 7-29-09 RWB, SD 2b 2c bag 214

Ventral:

Signs of heavy use. Heavy polish, deep striations both perpendicular and lateral to the blade edge, as well as extensive edge damage.

Dorsal:

Heavy signs of wear heavy polish, deep perpendicular striations, pocking, and extreme edge wear. This flake is very heavily used. The dorsal surface is much more concentrated signs of use than the ventral side.

Analysis:

This flake is massively used! Heavy polish, deep striations, pocking, and edge damage all symbolize how much this flake has been used. The ventral surface exhibits all the signs of wear that the dorsal surface does just in less qualities, the dorsal surface is concentrated and has massive use. The tool was used in a perpendicular motion to the primary blade edge. This is either a thinning flake with most use on the dorsal surface as evidenced by the size as well as the main wear on the dorsal surface. But that's inconsistent with wear on the ventral sit it's just the smallest scrapper in the world.

Artifact #63

492N 496.5 level 7 7-29-09 RWB, SD 2BU 2b bag 214

Ventral:

Medium wear, polish, striations, and edge wear. Striations run parallel to the blade edge.

Dorsal:

Lateral striations, medium polish, and edge damage This surface is heavily modified and contains less wear than the ventral surface.

Analysis:

This flake is heavily used on the ventral surface consistent edge damage, medium heavy polish, and striations going lateral to the blade edge. The dorsal surface heavily modified pre use as there is use on the flake scars. The dorsal surface is used less than the ventral. The ventral surface is the primary contact edge.

Artifact #64

498N 504E Level 7 2c quartzite 7/30/2009 Eh, JG Bag #155 6 AP

Ventral:

Very sporadic signs of use. Extreme light polish is all. I believe this flake due to the Dorsal but not the Ventral is a thinning flake or a retouch event of some sort.

Dorsal:

Light polish, perpendicular striations, lateral striations. Striations on both use edges. The most consistent polish occurs on the Primary use edges. This piece was used in a cutting motion and a scraping motion.

Analysis:

The flake was most likely used in a scraping and a cutting motion to the levels of striations and the direction of them. This flake is a thinning flake based on the wear on the Dorsal surface rather than the Ventral. The light polish and the striations are the only signs of this flake. The primary use edge is a cutting motion and the other side is a scraper due to the perpendicular striations.

Artifact #65

498N 504E Level 7 2c quartzite 7/30/2009 EH, JG Bag #155 6AP

Ventral:

Light polish, edge attrition, lateral striations, perpendicular striations, consistent light polish. Weird ass striations that make an "L" Even signs of use on both sides.

Dorsal:

Medium polish, striations perpendicular to the side edge. Medium polish but much more striations than anticipated deep, shallow, and multiple in a row appear along the side.

This flake has a significant amount of striations on it. Both sides of the flake appear to have similar wear to each other but the dorsal surface has the primary contact/use edge based on the striations. Ventral pic #4 has a weird “L” pattern of use. Evidence for scraping and cutting. But this flake is quite small. I’m not sure why these flakes are so small and evenly used.

Artifact #66

498N 504E Level 7 2c quartzite 7/30/2009 Eh, Jg Bag #155 6AP

Ventral:

Light polish, perpendicular striations, and little edge damage. This piece on this side is very much lightly used and is very much heat treated so this could be distorting the use a bit.

Dorsal:

This side has very consistent light polish but is much more consistent than the other side. This is the primary contact side.

Analysis: The primary contact side is the Dorsal Surface and is only symbolized by light polish consistent on the main use area. Very lightly used and heat treated. Unique flake to say the least.

Artifact #67

498N 504E Level 1 Bag#17 2c 16APU

Ventral:

Light polish, perpendicular striations to the blade edge this piece was at least used in a scraping motion this is very lightly used and shows signs mostly along one edge. Though a shallow flake scar also exhibits use and could distort some of the longer signs of use.

Dorsal:

All cortex no signs of use visible.

Analysis:

This tool is used though lightly so and it is only visible along the ventral surface as the dorsal surface is cortex. Light polish consistent along the blade edge and perpendicular striations visible along the use edge as well.

Artifact #68

498N 504E Level 2 16APR 7-10-2009 Bag 78

Analysis

Both the ventral and the dorsal surfaces have significant amounts of cortex however the lateral margins show macroscopic and microscopic signs of use. Light polish exists along the base of the lateral margins.

Artifact #69

498N 504E Level 2 10AP 7/10/2009 Bag 78

Analysis:

Both sides of this piece are cortex and very heavily so. However there is a good broken blunt edge that could be a scrapper. It has several microflakes consistent with edge damage taken out of it. However this piece is not used at all.

Artifact #70

498N 504E Level 2 8AP 7/10/2009 Bag 78

Side#1

This piece is interesting as it is a wedge. The lower margin that comes to a point is the primary use area and the opposite is the secondary. Light/medium polish is consistently used on the primary use edge and the secondary use edge is light polish.

Side:#2

Same thing almost exactly as the previous statement just less consistent.

Popper Site: 03:825

Artifact #1

485N 498E Level 5 projectile point 2a chert Bag 63

Side: 1

No signs of use other than hafting wear on the base of the point

Side:2

No signs of use other than hafting wear on the base of the point

Analysis:

Someone carried, created, and curated this piece at Popper until it was discovered. This piece was broken during excavations (skibo) and doesn't show any extensive signs of wear other than the hafting elements at the base.

Artifact #2

476N 500E Level 6 chert projectile point 2a A.C. L.I.T. bag 52

Side :1

There is no signs of use on this flake other than the hafting signs

Side: 2

There is no signs of use on this flake other than the hafting elements that are at the base.

Analysis:

The only signs of use at all on this flake are the signs of hafting at the base, once again this flake was created, curated, and eventually deposited at some point. This biface is the largest of the three but still not used.

Artifact #3

484N 495E Level 2 projectile point 195N 90E 38B.D. 18cm below surface Bag 53

Side: 1

This biface has only signs of hafting elements on it. There is no other signs of use on this side of the tool

Side: 2

This biface has only signs of hafting elements on it. There is no other signs of use on this side of the tool.

Analysis:

This biface is from 200km away and is made from bayport chert. Why this biface was created and then travelled over 120 miles but not utilized in any stretch of the imagination I'm not sure why this is.

Artifact #4

486N 495E Bag 137 V.P.G. 07/30/2007 code: 2c

Ventral:

This side shows consistent wear along the use edge. Light polish lateral and perpendicular striations. Used in a cutting motion and a scraping motion.

Dorsal:

Light/Medium polish consistent throughout the areas of the flake that have been reworked the majority of these exhibit signs of use. The two areas that have no cortex have been utilized with light polish and perpendicular striations along the secondary use edge on this side.

Analysis:

This flake is nicely used and has a good size to it compared to the ones from Duck Lake. Light polish consistent along the use edge on both Dorsal and Ventral sides. Dorsal surfaces are cortex but has two flakes knapped out of it and used as a tool based on retouch. This piece had inverted topography in some spots and I'm not sure what that means but it's important to note.

Artifact # 5

476N 502E Level: 3 code: 2c 07/21/2007 F.N. Bag 433

Ventral:

Medium polish perpendicular striations. This piece is partially heat treated so the signs of wear are difficult to determine. It is shockingly used.

Dorsal:

All cortex

Analysis:

This piece is utilized in a scraping motion and can be characterized as utilized. Medium polish on the primary ventral contact side. This piece has been utilized though heat treated possibly this does show wear very well.

Artifact #6

476N 502e Level 3 code: 2c 07/21/2007 F. N. Bag 433

This piece is a triangle and is an odd shape with edge reworking and some signs of use but mainly perpendicular striations that run all the way through the piece most likely not associated with use. Reworked but not used.

Artifact # 7

485N 496E code: 2APR Level 2 Bag 285

Side: 1

Light/medium polish, lateral striations and moderate edge damage primary and secondary use edges on this tool both have significant consistent wear. Both of the use edges have lateral striations.

Side: 2

The modified edge has light polish and lateral striations. These two use edges are both used laterally the secondary use edge isn't the same as the secondary use edge on the first side.

Analysis:

The primary modified edge is not the primary use edge it's the secondary use edge. The modified edge could have been disturbed in terms of use. There are signs of use on the modification. The primary use edges are different on the sides but show similar kinds of wear. Medium polish, lateral striations, and moderate use edges. The tool is used very consistently and completely.

Artifact #8

484N 494E Level 3 07/24/2007 Bag 433

Ventral:

Wear on all sides and edges. Medium polish is the only sign of wear. Edge attrition is minimal most likely used on something soft.

Dorsal:

Medium polish consistent throughout use on all sides of this flake and I'm not sure as to why. Edge attrition minimal at best all sides utilized.

Analysis:

The ventral surface is the primary contact side and is limited to only medium polish. All sides and edges show massive amounts of medium polish and that's it. Weird piece should be a scrapper but it's not.

Artifact #9

483N 495E Level 7 Bag 62 code: 6APR

Ventral:

Heavy & Medium polish, perpendicular and lateral striations, pocking as well. This piece is massively used along the retouch edge and very much along the cortical side as well.

Handwear??

Dorsal:

Largely cortical except for the retouched side. Consistent light polish with in the retouch perpendicular and later striations.

Analysis:

This tool is very massively used more than likely as a scrapper. The cortical edge on the ventral surface may show hand wear. Heavy polish to light polish. It is evident that the retouch was a true retouch event. There is use within the retouch edge attrition is nil due to the retouch episode.

Artifact #10

476N 500E Level 2 Bag 416 A.C. L.H. 07/11/2007

Ventral:

Perpendicular striations, light polish consistent throughout but mostly along the primary reworked edge. Pocking and no edge attrition due to the reworked nature of the edge of the tools.

Dorsal:

Light polish consistent along and in the reworked edge. The rest is cortex.

Analysis:

The ventral surface is the primary contact side and the retouched surface is the surface that leads. Perpendicular striations, light polish, and sporadic pocking are consistent along and within the reworked episode. Used post reworking.

Artifact #11

486N 495E Level:2 E.L. V.P.G code: 2c retouched 07/28/2007 Bag 430

Ventral:

Light polish throughout the flake there is a large flake taken out of the center with less use.

Dorsal:

Light consistent polish along the blade edge.

Analysis:

Very light use light polish is all.

Artifact #12

486N 495E Level 2 E.L. / V.P.G. 2c retouched 07/28/2007 Bag 430

Ventral:

This is very lightly used. All edges show extremely sporadic light polish and one instance of lateral and perpendicular striations but this was on one high point of the topography.

Dorsal:

Even less sporadic at best may used.

Analysis:

This flake is huge but is barely used if at all. This is very interesting as it is large retouched and the Dorsal surface but not used.

Artifact # 13

485N 498E Level: 5 code: 2c retouched 07/19/2007 Bag 353 EM/ P.M.

Ventral:

Light polish, lateral and perpendicular striations. The reworking on this side distorts the signs of use so it's getting reworked and not used after.

Dorsal:

Light polish within the reworking episodes on this tool. It means the ventral side is modified and not used. But the dorsal side is modified and used.

Analysis:

The secondary use edges on both sides match up on signs of wear on both surfaces. The primary use areas along the tool are modified in different episodes. The ventral surface is modified and

not used again. The Dorsal surface is modified and then used. Meaning that the dorsal modification is older than the ventral. Signs of use match up on both surfaces. The reworked edge was used in a scraping motion and the lateral margin was used in a cutting motion.

Artifact #14

476N 498E Level 2c A.C. E. H. Bag 282 07/28/2007

Ventral:

Medium polish, lateral and perpendicular striations this piece I would have expected more wear. Sporadic signs of the afore mentioned signs of use. Very lightly used.

Dorsal:

The dorsal surface is the primary contact side. This side is more heavily used than the ventral surface. Consistent medium polish, lateral and perpendicular striations, and dorsal retouch.

Analysis:

The Dorsal surface is the primary use side. There is use within the Dorsal Retouch and Deep perpendicular striations no edge damage.

Artifact #15

476N 498E Level 3 2c A.C. E.H. Bag 282 07/28/2007

Analysis:

Dorsal surface contains long lateral striations. No other signs of use.

Artifact #16

476N 498E Level 3 2c A.C. E.H. Bag 282 07/28/2007

Ventral:

Light polish consistent along the edges of the tool.

Dorsal:

Lateral striations, light polish, very lightly used.

Artifact #17

478N 498E Level 4 A.C. E. H. 07/31/2007 Bag 392

Ventral:

Medium and heavy polish, lateral striations, heavy edge wear, and pocking. This side is heavily used and shows signs of significant wear.

Dorsal:

Heavy polish, lateral and perpendicular striations, pocking, and significant edge wear. This piece is very heavily utilized along both lateral margins one showing retouch (use within) and are the primary and secondary use areas much more use than the ventral surface.

Analysis:

This tool is very heavily utilized. Heavy polish pocking, and striations. This piece was used in both a cutting and a scraping motion.

Artifact #18

478N 498E Level 4 A.C. E.H. 07/31/2007 Bag 392

Ventral:

Medium and heavy polish, lateral striations, moderate edge damage. Very well used consistent wear along the primary use edge.

Dorsal:

Medium polish, moderate edge damage. The rest is cortex moderate edge damage along the edge and the rest is cortex.

Analysis:

Medium polish along the Dorsal edge and heavy polish lateral striations with moderate edge damage. Very well used and Ventral surface is the primary contact side.

Artifact #19

478N 498E Level 4 A.C. E.H. 07/31/2007 Bag 392

Ventral:

Heavy polish, perpendicular striations, moderate edge damage, and pocking. This tool is very consistently used.

Dorsal:

Heavy polish, perpendicular striations, pocking, and moderate edge damage.

Analysis:

This tool is very well and consistently used. I'm unaware of a tool that is so consistently well used on each edge from this assemblage as of yet. This tool is small and makes little sense as to why (How it's used) But it is very heavily utilized. It's not a large tool but it is very well utilized in a perpendicular motion.

Artifact # 20

476N 498E 2b A.C. E.H.Bag 278

Ventral:

Heavy polish, pocking, and very well used. I'm unsure as to how but it's well used. This is the primary contact side even wear throughout the tool.

Dorsal:

Very heavy use. Lateral striations, pocking, and heavy polish. Very well used flake.

Analysis:

This tool was very heavily used and it is used in a cutting motion based on the striations that appear on the lateral margin.

Artifact #21

476N 498E Level 3 2b A.C. E.H. Bag 278

Ventral:

Lateral striations, heavy polish, pocking all consistent wear throughout the surface.

Dorsal:

Pocking, heavy polish, lateral striations used in a cutting motion.

Analysis:

This tool appears to be a thinning flake but it's not. Both surfaces are heavily used in a cutting motion.

Artifact #22

476N 498E Level 3 2b A.C. E.H. Bag 278

Ventral:

This tool is used primarily along the main use are these signs are medium polish. No as consistently used as the other side.

Dorsal:

This flake is moderately used. Lateral striations and medium polish occur en masse' this is the primary contact side. Very well used on this side.

Analysis:

It is strange that the largest of the tools is used the least and is used along the Dorsal surface much more than the Ventral surface.

Artifact #23

486N 498E Level 5 2c V.P.G. 8/2/2007 Bag 398

Ventral:

Very very light sporadic polish not discernable for use or not.

Dorsal:

Very light extremely sporadic polish, not discernable for use.

Analysis:

It is possible that the Dorsal retouch took the signs of wear off.

Artifact #24

486N 498E Level 5 c V.P.G. 8/01/2007 Bag 398

Ventral:

Very light polish along primary use edge just used well enough to be called used.

Dorsal:

Light sporadic polish along the primary use edge.

Analysis:

This tool is very lightly used on all surfaces but most consistent along the ventral surface bottom edge. Similar use along both sides of the tool along the use edge.

Artifact #25

486N 495E Level 5 2c V.P.G. 8/1/2007 Bag 398

Ventral:

Sporadic pocking, medium polish, all very sporadic. No retouch episode that has distorted the view of the polish that should appear but doesn't.

Dorsal:

Sporadic very sporadic medium polish.

Analysis:

These last three 23, 24, 25 have all exhibited some sort of retouch but little sporadic wear at best. It appears that these tools are not very heavily utilized. It's odd that they are morphologically a tool that should be used but it isn't used at all or just barely so.

Artifact #26

486N 495E Level 3 2c V.P.G. 7/30/2007 Bag 292

Ventral:

There appears to be retouch on the tool but it's not utilized.

Dorsal:

All cortex.

Analysis:

This looks used/ retouched but it is not. Not used at all very odd.

Artifact #27

486N 495E Level 3 2c V.P.G. 7/30/2007 Bag 292

Ventral:

Not used

Dorsal:

Light polish semi-consistent along the primary use edge.

Analysis:

This flake is not used on the ventral surface but is solely used along the Dorsal surface. Along the primary use edge. This flake is very heavily not used and only lightly so along the dorsal use edge.

Artifact #28

486N 495E Level 3 2c V.P.G. 7/30/2007 Bag 292

Ventral:

Consistent medium polish along the length of the tool. The ventral side is most definitely more used than the Dorsal surface. No striations but significant use.

Dorsal:

Consistent medium polish along the two use edges on this side of the flake.

Analysis:

This flake follows the pattern of tools that don't exhibit striations but that have medium polish only. I'm not sure what it is but something is going on.

Artifact #29

476N 502E Level 2 F.N. 07/24/2007 Bag 432

Ventral:

Light to medium polish on this side with sporadic lateral striations on each surface. The retouch happened after use, there is less use on the flake within the flake scars than along the rest of the flakes.

Dorsal:

Light/Medium polish lateral striations. This piece is lightly used on the dorsal surface. Due to the nature of the knapping.

Analysis:

This is a very heavily used flake not in the flake scars. This piece was utilized post retouch episode. Then lightly used again based on the use within the flake scars. This is very interesting more use on the ventral surface than the Dorsal. Retouch episodes distorted the signs of use on this flake.

Artifact #30

478N 498E Level 4 A.C. E.H. 07/31/2007 Bag 392

Ventral:

Sporadic light polish along the secondary use edge on this flake.

Dorsal:

Consistent light polish along the primary use edge on this side. Secondary use edge is also on this side as well.

Analysis:

This flake exhibits an interesting case. Both lateral margins on the Dorsal surface are the primary and secondary use edges. It is very interesting to note that there is moderate edge reworking pressure flaking along the dorsal surfaces. This flake carries on the consistent light use on these tools.