# Preliminary Assessment of Chipped Stone Items from Archaeological Site 24ME1105

By

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## ABSTRACT

An analysis of a small sample of archaeological chipped stone items was conducted. The evidence suggests that site 24ME1105 is a locality where precontact occupants collected the locally exposed chert and largely produced flakes and quarry blanks. The desired artifacts were subsequently removed from the site and presumably traded and/or used for a variety of tools as the need arose. Additional research in site 24ME1105 may help to address several uncertainties identified herein.

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# 1.0 DATA ORGANIZATION AND ANALYTICAL METHODS

## 1.1 Descriptive and Analytical Procedures

The cultural materials presented in this study were collected by Lynn Peterson during June 2019 from archaeological site 24ME1105. The artifacts were recovered from three spatially distinct locales: Shovel Probe 1 (SP-1), Shovel Probe 2 (SP-2), and Test Unit 1 (TU-1). Shovel Probes 1 and 2 were excavated to a depth of 30 cm below present ground surface (BS) without respect to 10 cm thick levels. Test Unit 1, a 1 m square unit, was excavated in 10 cm thick levels to a depth of approximately 1 m BS. Cultural materials were recovered in every 10 cm level (including the ground surface) to a depth of 90 cm BS. The majority of cultural material occurred from approximately 20-50 cm BS. Excavated sediments were screened through ¼ inch wire mesh. Cultural materials were collected and bagged according to horizontal and vertical provenience. Because distinct cultural components were not identified during excavation, the group of cultural remains are treated here as a single collection. The data has been organized in such a way, however, that it can be segregated and re-analyzed should future research determine stratified deposits or distinct assemblages occur in 24ME1105.

Definitions of terms used herein to organize the culturally modified stone, as well as procedures used to visually organize selected data, are presented in detail in Baumler and Davis (2000), Brumley (1981), Hall and Larson (2004), Kooyman (2000), Munson and Ferguson (1999), Rennie (2002), and Whittaker (1994). Cultural materials recovered and discussed herein are organized into a number of groupings for analytical purposes. The first grouping is referred to as Cultural Material Units (CMU). The CMU designations for site 24ME1105 are based on provenience and then by items that may warrant additional study. Defined CMUs for the site are summarized in Table 1. In addition to CMUs, the recovered cultural items are grouped by artifact type, then by lithologic class. The following definitions explain how the recovered cultural materials were individually or collectively categorized for this study:

*Bifaces* are flaked stone pieces characterized by moderate to complete modification and shaping as a result of bifacial-flaking. Following Whittaker (1994:202), a Stage I biface refers to an edged blank. In this initial stage of biface manufacture, a piece of lithic raw material (typically a large flake, flattish cobble, or tabular piece) is edged by the removal of flakes around the perimeter of the blank. This is typically accomplished by removing a flake from the edge of the blank toward the centerline on one surface, then turning the piece over and removing a flake from the opposite surface of the same edge. The idea is to establish a crude biface with numerous striking platforms around the perimeter of the piece. Most Stage I bifaces have wavy edges, are fairly thick (width is about twice the thickness) and have steep edge-angles between 50 and 80 degrees. A Stage II biface refers to a piece of lithic raw material that has been initially edged and shaped and has undergone partial or complete primary thinning through the removal of major ridges and irregularities (flakes have been removed which cut across the surfaces of the piece). A Stage II biface can exhibit a wide range of cross-section shapes with moderately straight and centered edges. The edges typically exhibit steep angles which fall between 60 and 40 degrees.

Table 1: Cultural Material Unit (CMU) Definitions Assigned to 24ME1105.

| CMU | Definition |
|---|---|
| 1 | Surface finds and out-of-context items that lack vertical and horizontal provenience information. |
| 2 | Cultural remains recovered from a controlled vertical and horizontal context. |
| 3 | Cultural items of particular interest. |

Further, a Stage II biface is typically three to four times as wide as it is thick and it is generally considered to exhibit the highest ratio of break resistance to portability in the bifacial reduction sequence. Stage II bifaces are referred to as preforms or quarry blanks because they are commonly found at tool-quality stone quarry/collection sites. A Stage III biface is generally defined by Whittaker (1994: 203) as a refined biface. During Stage III reduction, flakes are further removed across the biface surfaces in an effort to considerably thin the artifact and flatten the cross section. Completed Stage III bifaces should exhibit width/thickness ratios of 4.00 or greater and edge angles that fall between 25 and 45 degrees. Similar to Stage II bifaces, however, refined bifaces lack a specified shape. Callahan (1979:116) refers to this phase in the reduction sequence as Stage IV but also uses the terms "trade blanks" or "cache blanks", because caches of such refined bifaces have been discovered throughout the New World. It should be noted that Whittaker's (1994) Stage II and Stage III biface descriptions largely correspond with Callahan's Stage III and Stage IV categories (Callahan 1979). Either Callahan's or Whittaker's reduction scheme is acceptable. Choosing one over the other is a matter of personal preference. The primary weakness in both is the subjectivity of classifying intermediate stages of bifaces that exhibit characteristics of any two sequential stages of production. Bifaces are described herein as to reduction stage, shape, and condition. Structural problems, as well as evidence of use/transport wear and intentional retouch, are also noted. Bifaces identified herein typically served as preforms or cutting/scraping tools. Although projectile points and some cores can be bifacially flaked implements, they are placed within discrete formal tool categories for purposes of this study and because of the known (or suspected) function that they served.

*Core/core tools* are considered here to be stones, or pieces of stone, utilized for the intentional production of flakes. By-products of core preparation and intentional flake removal consist of inadvertently generated flakes as well as dust and shatter. Cores exhibiting evidence of subsequent use as implements (such as choppers or scraper planes) are referred to as core tools. The presence of cores in a site is typically inferred to reflect localized flaked stone tool production. Conversely, the presence of moderate to large amounts of shatter is a corollary for the initial stages of core reduction. Cores and miscellaneous lithic tools are described as to type, shape, and extent of utilization. When applicable, evidence of subsequent use of cores for purposes other than debitage generation is also noted.

*Unmodified Debitage* is lithic material generated, intentionally or inadvertently, during the course of chipped-stone tool production and maintenance, and which exhibits no evidence of subsequent modification or use. Following Sullivan and Rozen (1985:759), the term debitage includes diagnostic flakes that exhibit analytically intact margins and largely intact platforms (*complete flakes*); flakes that retain their platforms or proximal edges, but otherwise appear to be incomplete (*broken flakes*); flakes that lack proximal portions and sometimes extreme distal edges (*flake fragments*); and *shatter*. Shatter consists of both angular pieces that lack intentional flake production characteristics and thin, flake-like pieces that cannot be easily oriented to distal or proximal ends, interior or exterior surfaces. Sullivan and Rozen (1985) use the term "debris", but we use "shatter" to avoid confusion when discussion "chipped stone debris" meaning general debitage. Much of the larger size-grade shatter tends to be angular whereas most of the mid and late stage shatter is thin and flake-like. Further, primary reduction pieces of shatter are readily detected, but later reduction stage shatter can be thin and flake-like in the Size Grade 3-5 classes.

For diagnostic flakes, terminations that form sharp thin edges are referred to as feathered. Hinge terminations show a rounded and outward tilting end. Step terminations generally have rounded edges at the exterior flake surface and a sharp, ~90 degree edge at the interior side thus distinguishing these latter pieces from broken flakes that generally lack the rounded terminal edge. Platforms are categorized to type to help substantiate claims of biface generation from unprepared flake core reduction. Flake thickness including bulbs of percussion are noted to try to distinguish hard hammer from soft hammer percussion evidence. Presence/absence of cortex is also noted to help identify initial reduction of raw pieces of stone from secondary refinement.

*Debitage with Edge-Flaking/Modification (DEF/M)* describes flakes and shatter that:
(1) exhibit a series of flake scar removals along one or more edge of the piece; or
(2) exhibit edge-rounding and polish, attributed to repeated scraping or rubbing.

The category of DEF/M includes pieces commonly referred to by other researchers as marginally retouched stone tools, utilized flakes, side scrapers, and retouched flakes. Excluded are the more formal shaped tool categories such as bifaces, endscrapers, drills/awls, gravers, denticulates, and spokeshaves even though formal tools may exhibit intentional or incidental retouch. For DEF/M, the edge-flaking, or other edge-modification, is generally limited in extent and has not resulted in major modification to the piece. Edge-flaking/modification is not always intentionally produced. Sometimes a series of small flake removals from the edge of a piece can form incidentally during flake-stone tool production. Similar small flake removals can also incidentally occur during use of the piece as an implement. Because the resulting edge damage of these two processes often times cannot be readily distinguished, the unintentional modification is typically referred to as "use-wear." Additionally, edge-battering during transport, or post-depositional processes can produce pseudo-retouch. Alternately, edge-flaking/modification can be intentionally generated through preparation of a tool's edge (retouch) or rejuvenation (resharpening) of a dulled edge (cf. Odell and Odell-Vereeken 1980).

## 1.2 Lithic Analysis

Information recorded for the recovered chipped stone generally follows procedures established or refined by many researchers and currently accepted as useful. See Knell (2012) for a summary of lithic analytical approaches applied herein. Additionally, fracture patterns exhibited among the projectile points, bifaces, and endscrapers were described as to type; evidence of heat-treating was noted; and attention was paid to the kinds of lithic reduction strategies reflected among the cores and lithic debitage in site 24ME1105. Throughout the chipped stone items discussion section specific artifacts are referenced by catalogue number, or by the MANA designations (lithic raw material subdivision) they represent.

All stone artifacts and debitage are segregated by defined lithic raw material groupings. These groupings are based, first, on lithologic class and, second, on perceived visual and textural differences. This approach is established elsewhere (see Ingbar et al. 1989; Kornfeld et al. 2010, Hall and Larson 2004) as Minimum Analytical Nodule Analysis (MANA). Once segregated, each distinct lithic material grouping was assigned a letter-number code. Minimum Analytical Nodule Analysis (MANA) lithic material codes used for this study are taken from Rennie (2002). The lithic material codes are detailed in Appendix 1 of this report. The utility in subdividing lithic cultural material into MANA categories is, in part, that the distinct groupings provide a meaningful way of organizing culturally modified lithic materials that were likely produced from the same, or very similar, pieces of stone. Further, those groupings provide a more specific means of discussing the kinds and varieties of imported and locally available lithic raw materials in an archaeological site. A weakness in applying the MANA approach is the fact that the larger the piece of lithic raw material is prior to reduction, the greater the possibility for variability in the color/texture range of the piece. This could result in multiple MANA designations being assigned to pieces generated from only a single, large piece of lithic raw material. An additional issue is that small (Size Grades 3 and smaller), thin flakes of semi-translucent chert can be difficult to consistently assign to a MANA lithic material code.

Unmodified stone debitage and DEF/Ms are size-graded generally following methods established by Ahler (1989) and more recently discussed and applied by Baumler and Davis (2000:24). This study involved a series of five stacked screens of sequentially half-size smaller openings. The uppermost screen (SG1) consists of 1-inch-square wire mesh. The bottom screen (SG5) is composed of 1/16 inch (window screen size) wire mesh. The utility of size grading is explained as, "Frequency and, in some cases, weight by size class provide a meaningful expression of the relative volume of the assemblage comprised by smaller and larger artifacts within as well as across the different raw material groups (Baumler and Davis 2000:24)." Benefits and weaknesses in a size-graded, aggregate approach are detailed elsewhere (e.g., Andrefsky 2001, Hall and Larson 2004, Root 2004).

Flakes were separated from shatter, and flakes were further distinguished based on their condition following terms (*complete*, *broken*, and *flake fragment*) established by Sullivan and Rozen (1985). Shatter, as defined for this study, consists of both angular pieces that lack intentional flake production characteristics and thin, flake-like pieces that cannot be oriented to distal or proximal ends, or interior/exterior surfaces. Detailed summaries of the utility, and shortcomings, of the Sullivan and Rozen typology are presented and summarized elsewhere (e.g., Andrefsky (2001), Baumler and Davis (2000:24-25), and Roll (2003). Flakes and shatter were further sub-divided into potential categories of reduction stage based on extent of cortex and number and orientation of flake scars on the exterior surface of the piece. The extent of exterior (dorsal) surface cortex was noted following Knell (2012) where percent of dorsal cortex is coded as 0 (no cortex), 1 (1%-49% surface coverage), 2 (50%-99% surface coverage), and 3 (100% surface coverage). This attribute helps to substantiate interpretations of on-site vs. off-site lithic reduction. Next, the kind of platform exhibited on broken and complete flakes was noted, as was general flake shape and manner of flake termination. This was done in an effort to generally distinguish core-shaping/thinning flakes, biface reduction flakes, finishing flakes, and possibly resharpening flakes (Kooyman 2000, Knell 2012). Combining debitage attributes with attributes coded for other tools and cores of the same lithic material code, sets the stage for analysis of individual MANAs.

Attributes of pieces defined here as DEF/M largely duplicate those for debitage but include the number of modified edges each piece exhibits and the nature of the edge-modification. Suggestions for what activities formed the DEF/M follow results of experiments carried out and reported by McBrearty et al. 1998, Odell and Odell-Vereeken (1980:99), and Tringham et al. (1974:188-189).

## 2.0 CHIPPED STONE ITEMS ANALYZED FOR THIS STUDY

The locally available chert material constitutes most or all culturally modified pieces analyzed with this study. The quality of the local chert material in and surrounding site 24ME1105 is generally marginal from a flintknapping perspective. The color and texture range of the local deposit is dominated by red and yellow tones with more microcrystalline textures than cryptocrystalline. Several pieces exhibit potlids with a lesser amount having a glossy appearance or even crazed fracturing (numerous hairline fractures) typically assumed to be a product of poorly controlled heat. A sample of the local chert (Figure 1) was heat-treated in a roaster oven with a thin layer of sand placed in the bottom. The pieces were baked at 250° F (121° C) for 1 hour, then the temperature was raised to 350° F (177° C) for three hours. This was followed by raising the roaster oven to its highest setting of 450° F (232° C) for another four hours. The pieces were allowed to cool slowly overnight. The following day the pieces were inspected. It was observed that the effort to heat-treat was unsuccessful. No noticeable change in color or texture had occurred. It is possible that a higher controlled heat would result in the desired effects toward improving knappability of local chert, but that will need to be a separate experiment. Interested to learn if potlids would form if the chert samples were subjected to uncontrolled heat. A bundle of dried grass was placed in a metal tub and burned. The chert samples were placed in the middle of the grass mound and the grass fire burned for approximately five minutes. The chert samples were collected approximately 2 hours later after the ashes had cooled. As seen in Figure 1, exposure to fire, such as might occur in a wildland fire scenario, changed the color of all pieces to a dull red. Structurally the material became quite brittle giving the pieces the knappability of low-grade clinker. Interestingly, potlids, crazing fractures, or glossy surfaces were not produced during any of the experimental heating exercises.

Detailed descriptions of the various artifact classes pertaining to site 24ME1105 are presented hereafter. Table 2 provides a summary by count and weight of all cultural material currently assigned to 24ME1105. In total, 629 items with a combined weight of approximately 23.7 kg (52 lbs.) were inspected for this study. Because distinct cultural components were not defined, the total collection is analyzed here as a single unit. Considering that cultural materials were recovered to a depth of approximately 90 cm below the present ground surface (BS), multiple components are likely represented. It is currently unknown if contextual integrity exists among the pieces studied and reported on herein.

Table 2: Summary by Count and Weight of 24ME1105 Cultural Material.

| | Cultural Material Categories | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Hammerstone | FCR | Bone | Core | Unmodified Debitage | DEF/M | Endscraper | Biface | P.P. | Drill/ Awl | Burin/ Graver | Spokeshave | Total |
| Count: | 0 | 0 | 0 | 6 | 617 | 2 | 0 | 4 | 0 | 0 | 0 | 0 | 629 |
| %Total #: | 0% | 0% | 0% | <1% | 98% | <1% | 0% | <1% | 0% | 0% | 0% | 0% | 100% |
| | | | | | | | | | | | | | |
| Weight (gms): | 0 | 0 | 0 | 905 | 1,125 | 8 | 0 | 332 | 0 | 0 | 0 | 0 | 2,370 |
| %Total #: | 0% | 0% | 0% | 38% | 47% | <1% | 0% | 14% | 0% | 0% | 0% | 0% | 100% |

Abbreviations: FCR- firecracked rock; DEF/M- debitage with edge-flaking or other edge modification; P.P.- Projectile point

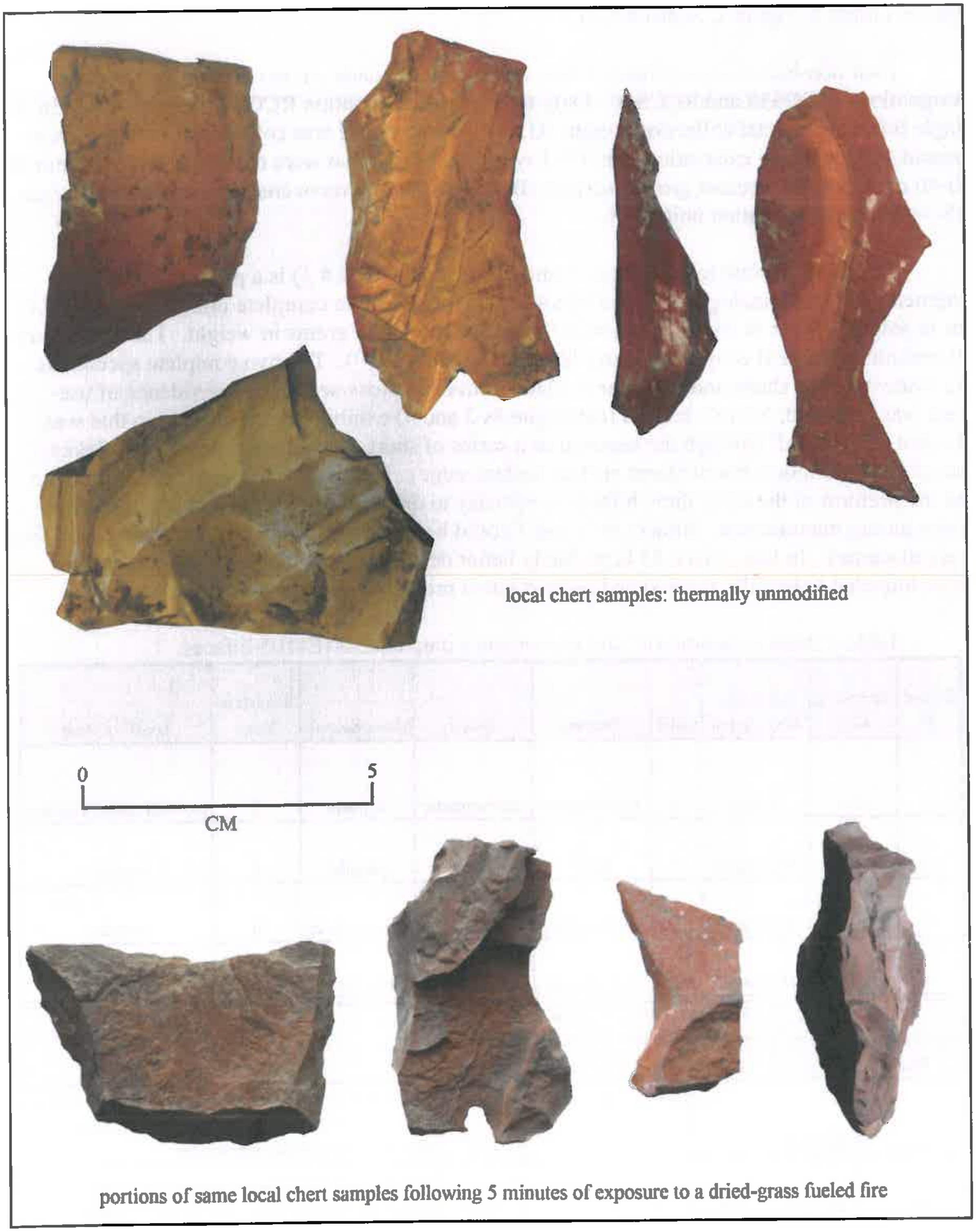


Figure 1: Raw chert samples and same samples following intensive heating.

*Bifaces* (Table 3, Figure 2, Appendix 1)

Four non-hafted chert bifaces/biface fragments are made on two distinctive MANA designations: RCCS38 and RCCS50. Only the MANA designation RCCS50 is represented by a single biface. The total collection weighs 332.43 g. One biface was collected from the current ground surface where excavation unit TU-1 was established, two were recovered from a depth of 30-40 cm below the present ground surface (BS), and one was recovered at a depth of 40-50 cm BS—all within excavation unit TU-1.

Two are complete (catalogue #s 2 and 3), one (catalogue # 1) is a proximal-medial fragment, and one (catalogue # 5) is a lateral fragment. The two complete bifaces average 10.7 cm in length, 4.9 cm in width, 1.85 cm in thickness, and 126.5 grams in weight. The bifaces are all considered stage II or typical quarry blanks (Callahan 1979). The two complete specimens are ovate/ovoid in shape and irregular to plano-convex in cross-section. No evidence of use-wear was observed, but two bifaces (catalogue #s 2 and 4) exhibit one lateral margin that was abraded or "nibbled" through the removal of a series of short, steep-angled percussion flakes intended to strengthen the platform surface (biface edge). Biface #2 was made on a large flake, but the preform of the other three bifaces is not easy to determine. Bifaces #s 1 and 4 likely broke during manufacture. Bifaces #s 2 and 3 could be further refined, so it is puzzling why they were discarded. In fact, biface #3 is probably better described as a bifacial flake core then a piece intended to be fully thinned and refined into a projectile point or hafted knife.

Table 3: Metric, nonmetric, and provenience data for 24ME1105 bifaces.

| Record # | Excavation Unit | Excavated Level Depth | CMU | Preform | Shape | Cross-Section | Reduction Stage | Tool Condition | Retouch/Use-Wear | Lithic Material Code | Max Length (cm) | Max Width (cm) | Max Thickness (cm) | Weight (grams) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TU-1 | surface | 1 | indeterminate | indeterminate | bi-plano | II | proximal-medial fragment | none | RCCS50 | | 3.7 | 1.1 | 25.02 | Small area of cortexon on lateral edge. Difficult material to knap. Several step fractures represented on one face. Piece likely broke during manufacture. |
| 2 | TU-1 | 30-40 cm BS | 2 | flake | ovoid | irregular | II | complete | none | RCCS38 | 10.8 | 4.7 | 1.5 | 74.07 | Heavily ground/strengthened along one lateral edge. Typical quarry blank. Piece could be further thinned. |
| 3 | TU-1 | 30-40 cm BS | 2 | indeterminate | ovoid | plano-convex | II | complete | none | RCCS38 | 10.6 | 5.1 | 2.2 | 179 | Probably a bifacial core instead of a true quarry blank. Piece could be further thinned. |
| 4 | TU-1 | 40-50 cm BS | 2 | indeterminate | ovoid | bi-convex | II | lateral fragment | none | RCCS38 | 9.4 | 3.5 | 2.4 | 54.34 | Edge is ground/strengthened. Probably a quarry blank that broke during manufacture. |

Figure 2: Non-projectile point bifaces from 24ME1105.

*Cores* (Table 4, Figures 3-4, Appendix 1)

Six cores weighing a total of 905.4 grams were recovered from TU-1. Three cores (catalogue #s 1-3) were recovered from 30-40 cm BS, two (catalogue #s 4-5) were recovered from 40-50 cm BS, and one (catalogue #6) was recovered from 60-70 cm BS. Each exhibit varying amounts of cortex. Four (catalogue #s 1-3 and 6) are unprepared, opportunistic flake cores. Two (catalogue #s 4 and 5) are bifacial cores. The cores are generally moderately utilized, but not exhausted. Three distinct MANA designations, RCCS38, RCCS50, and YBCCS57 are represented by the cores. The cores include yellow tones that the bifaces do not. In fact, the yellow toned MANA designation YBCCS57 accounts for 50% of the cores.

Two cores (catalogue #s 2 and 3) were produced on small blocky pieces and one (catalogue #5) is made on a small nodule/large pebble-size piece. The preform of the other three pieces cannot be determined. Two cores were found in two pieces each when exposed through excavation (catalogue #s 2 and 3). These pieces have been rejoined.

As the reader can see, most of the cores would only produce small to moderate-size flakes even before they were discarded. The small sample of non-projectile point bifaces and discarded core pieces strongly suggest that a good deal of effort was put into opportunistic flake removal from irregular/unstandardized cores and rudimentary bifaces simply to produce small and medium-size, thin, and generally straight flakes. Presumably it was those flakes, as well as the desired early to mid-reduction stage bifaces, that were removed from the site for later use.

As noted by Callahan (1979:66), "When the hammer becomes too much heavier than the core, it tends to push the core rather than remove the flake." However, all of the recovered cores could still produce several small or medium-size flakes. Today it is in vogue to talk about lithic material conservation in archaeological contexts. If resource conservation was an issue in 24ME1105, then fewer pieces of usable lithic material would be expected. Perhaps it is the universal case for humanity that when resources are plentiful conservation is never given much thought.

Table 4: Metric, nonmetric, and provenience data for 24ME1105 Cores.

| Record # | Excavation Unit | Excavated Level Depth | CMU | Preform | Core Type | Shape | Extent of Utilization | Condition | Retouch/ Use-Wear |
|---|---|---|---|---|---|---|---|---|---|
| 1 | TU-1 | 30-40 cm BS | 2 | indeterminate | unprepared | amorphous | moderate | indeterminate | none |
| 2 | TU-1 | 30-40 cm BS | 2 | small block | unprepared | blocky | moderate | indeterminate | none |
| 3 | TU-1 | 30-40 cm BS | 2 | small block | unprepared | blocky | minimal | complete | none |
| 4 | TU-1 | 40-50 cm BS | 2 | indeterminate | bifacial | ovate | moderate | complete | none |
| 5 | TU-1 | 40-50 cm BS | 2 | small nodule | bifacial | amorphous | minimal | complete | none |
| 6 | TU-1 | 60-70 cm BS | 2 | indeterminate | unprepared | amorphous | moderate | indeterminate | none |

| Lithic Material Code | Max Length (cm) | Max Width (cm) | Max Thickness (cm) | Weight (grams) | Comments |
|---|---|---|---|---|---|
| YBCCS57 | 6.6 | 4.5 | 2.8 | 87.24 | Some cortex. Flakes opportunistically removed from all surfaces. Shows a desire for small and medium-size flake production. |
| RCCS50 | 9.5 | 6.4 | 4.9 | 331 | Some cortex. Flakes opportunistically removed from all surfaces. Shows a desire for small and medium-size flake production. Core recovered in two pieces (split longitudinally) but now rejoined. |
| RCCS38 | 8.2 | 8 | 3.6 | 239 | Some cortex. Flakes opportunistically removed from two surfaces (ends or edges). Shows a desire for small and medium-size flake production. Core recovered in two pieces (split laterally) but now rejoined. |
| YBCCS57 | 7.2 | 5.3 | 2.4 | 84.92 | Some cortex. Thick bifacial core. Shows a desire for small and medium-size flake production. |
| RCCS38 | 3.9 | 5.8 | 1.6 | 27.24 | Some cortex on both faces. Flakes opportunistically removed. Shows a desire for small and medium-size flake production. |
| YBCCS57 | 7 | 4.8 | 4.4 | 136 | Some cortex. Flakes opportunistically removed from all surfaces. Shows a desire for small and medium-size flake production. |

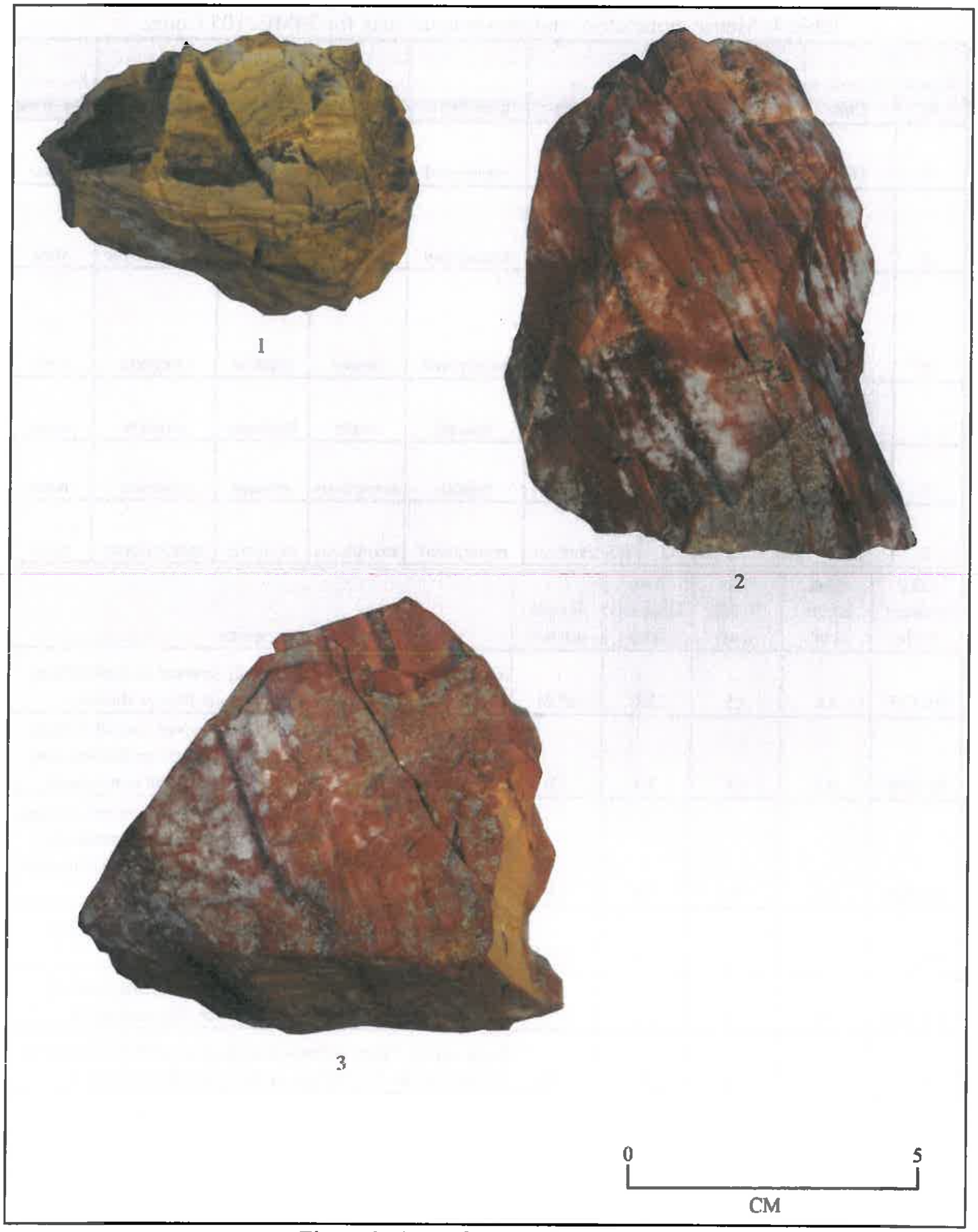


Figure 3: Cores from 24ME1105 (1).

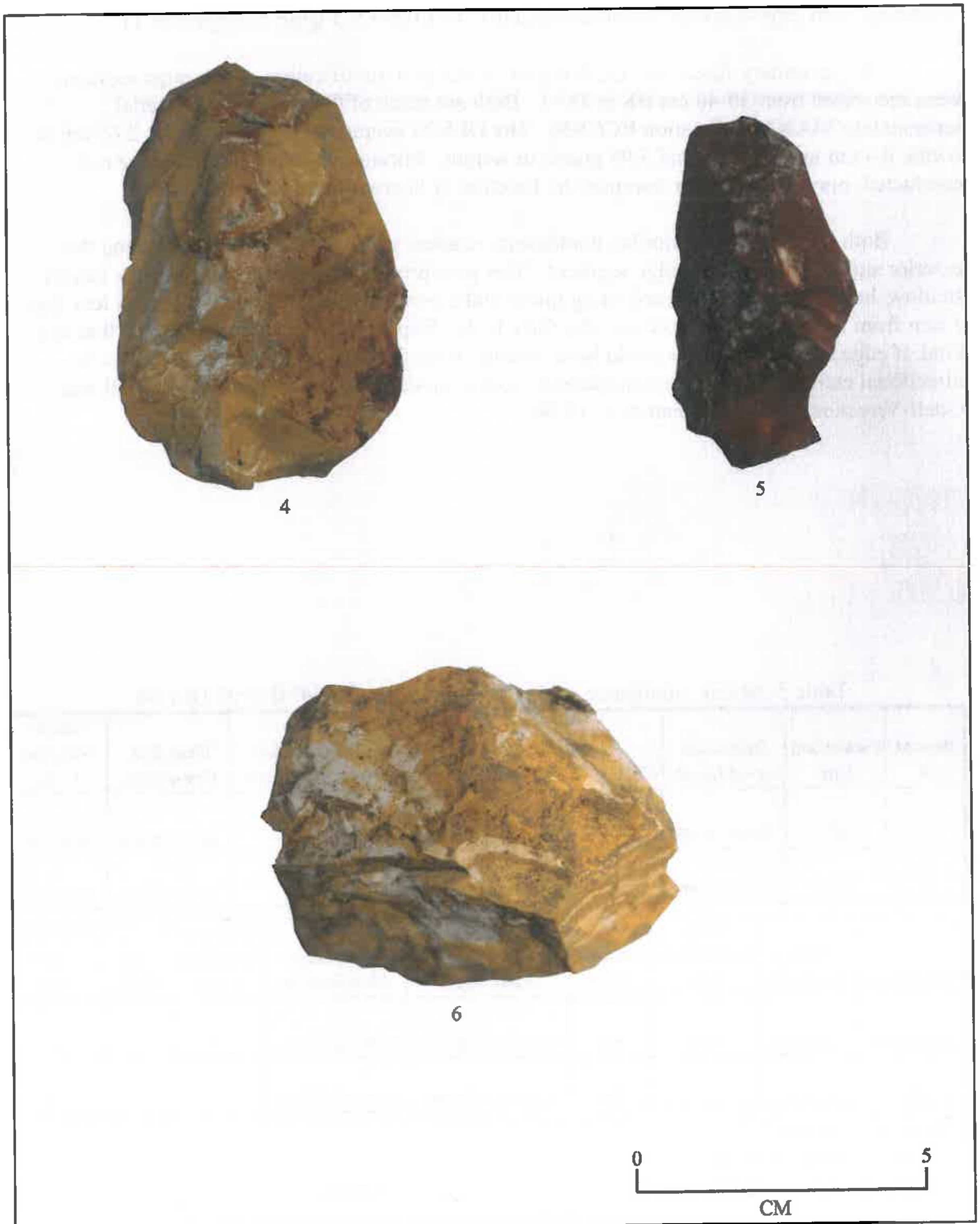


Figure 4: Cores from 24ME1105 (2).

*Debitage with Edge-Flaking/Modification (DEF/M)* (Table 5, Figure 5, Appendix 1)

Two secondary flakes that exhibit post-production modification of one edge segment were recovered from 30-40 cm BS in TU-1. Both are made of the same lithic material representing MANA designation RCCS50. The DEF/M average 2.35 cm in length, 2.65 cm in width, 0.4 cm in thickness, and 3.99 grams in weight. Microwear studies, which were not conducted, may help to better interpret the function of the recovered DEF/M.

Both DEF/M exhibit similar, continuous, shallow unifacial flake removals along the exterior surface of one short edge segment. This post-production edge-modification is largely shallow, broad, fine, feather-terminating micro-flake removals—most of which extend less than 1 mm from the edge of the piece into the flake body. Experiments have demonstrated that this kind of edge damage/use wear could have resulted from the piece having been used as a bi-directional cutting implement on moderately soft or moderately hard material (cf. Odell and Odell-Vereeken 1980, Tringham et al. 1974).

Table 5: Metric, nonmetric, and provenience data for 24ME1105 DEF/M.

| Record # | Excavation Unit | Excavated Level Depth | CMU | Debitage Type | Reduction Stage | Exterior Surface Flake Scar Count | Flake Scar Orientation | Lithic Material Code | Flake Shape | Flake Condition | Flake Termination Type | Platform Type | Flake Type | Type of Edge Modification | Number of Retouched Edges | Size Grade | Maximum Length (cm) | Maximum Width (cm) | Maximum Thickness (cm) | Weight (grams) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | TU-1 | 30-40 cm BS | 2 | flake | secondary | 2 | intersecting | RCCS50 | rectangular | fragment | n/a | n/a | shaping/thinning | unifacial flaking | 1 | 2 | 1.3 | 2.9 | 0.3 | 2.04 | Continuous, shallow unifacial flake removals along exterior surface of one edge. Probably use-wear. |
| 2 | TU-1 | 30-40 cm BS | 2 | flake | secondary | 2 | intersecting | RCCS50 | rectangular | broken | n/a | flat | shaping/thinning | unifacial flaking | 1 | 2 | 3.4 | 2.4 | 0.5 | 5.94 | Continuous, shallow unifacial flake removals along exterior surface of one edge. Probably use-wear. |

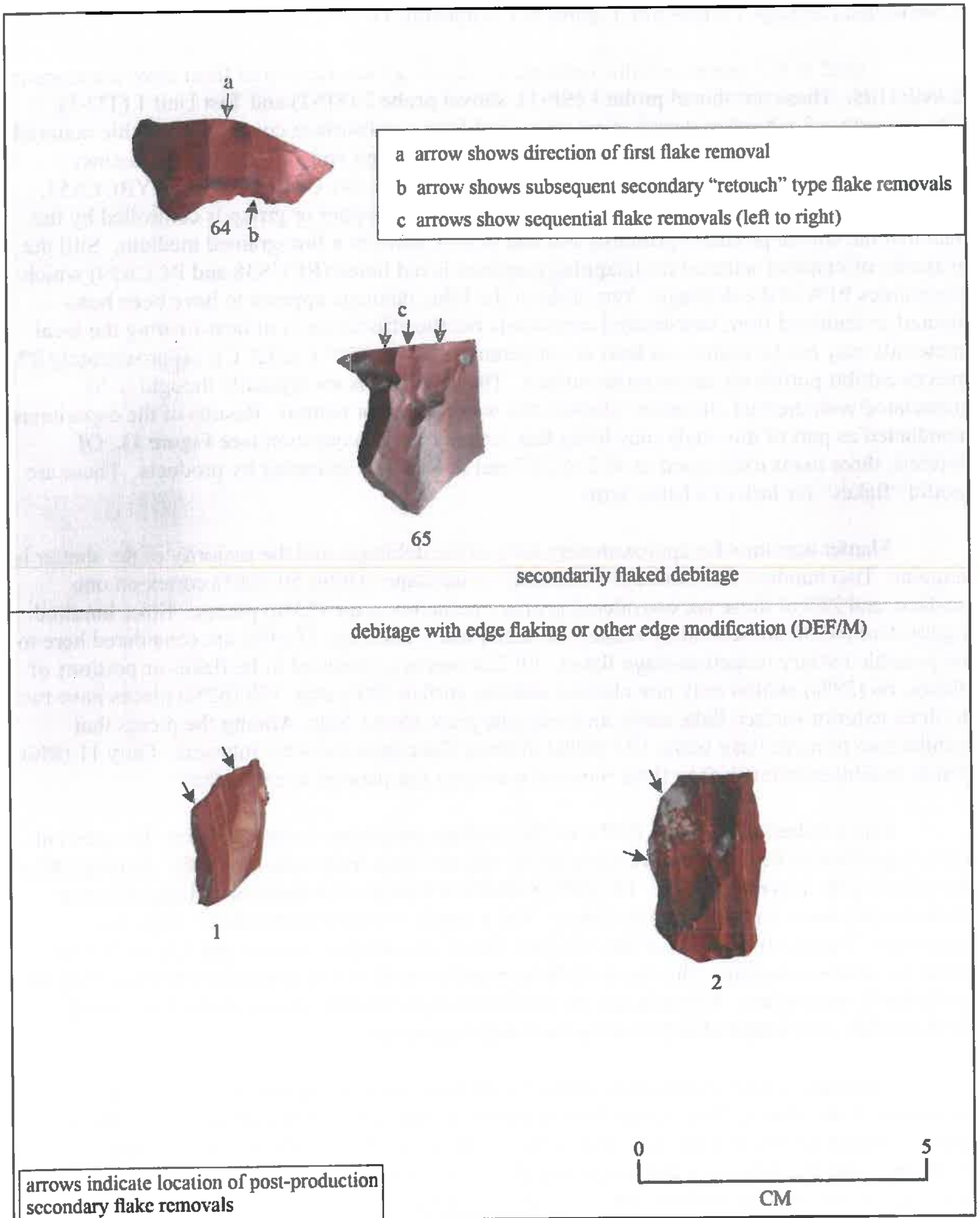


Figure 5: Debitage of interest and DEF/M from 24ME1105.

*Unmodified Debitage* (Tables 6-8, Figures 6-7, Appendix 1)

A total of 617 pieces of lithic debitage (1,124.67 g) was recovered from three locations in 24ME1105. These are shovel probe 1 (SP-1), shovel probe 2 (SP-2) and Test Unit 1 (TU-1). The majority of cultural materials were recovered from a subsurface context. The lithic materials analyzed for this study are believed to be locally derived chert and constitute eight distinct MANA designations: RCCS6, RCCS11, RCCS38, RCCS50, WCCS1, YBCCS42, YBCCS57, AND YBCCS58. Color/texture preferences by any given knapper or group is controlled by the fact that the source produces primarily red and yellow tones in a fine-grained medium. Still the majority of material selected for knapping purposes is red toned (RCCS38 and RCCS50) which constitutes 91% of the debitage. Very little of the lithic debitage appears to have been heat-treated or removed from heat-treated cores/tools but the effectiveness of heat-treating the local materials may not be useful—at least at temperatures below 450° F (232° C). Approximately 37 pieces exhibit potlids on one or more surface. These attributes are typically thought to be associated with thermal alteration whether this was cultural or natural. Results of the experiment conducted as part of this study may bring this assumption into question (see Figure 1). Of interest, three items catalogued as #s 236-237 and 306 are not knapping by products. These are potlid "flakes" for lack of a better term.

Shatter accounts for approximately 63% of the debitage, and the majority of the shatter is angular. Two hundred forty-three (39%) pieces of debitage exhibit 50-100% cortex on one surface, and 203 of those are considered primary reduction stage (33%) pieces. Three hundred eighty-five (62%) are secondary reduction-stage pieces, and only 27 (4%) are considered here to be possible tertiary reduction-stage flakes. Of 224 pieces considered to be flakes or portions of flakes, 66 (29%) exhibit only one obvious exterior surface flake scar, 138 (62%) pieces have two to three exterior surface flake scars, and only one piece shows four. Among the pieces that exhibit two or more flake scars, 127 (92%) of those flake removal scars intersect. Only 11 (8%) flakes exhibit exterior surface flake removal scars that run parallel to each other.

One hundred forty-seven (24%) of the debitage pieces are complete flakes, five percent (n=31) are broken flakes, and seven percent (n=46) are flake fragments (Table 8). Among 189 of the pieces with intact distal ends, 184 (97%) exhibit a feathered termination. Hinge and step terminations occur among only five flakes. Not a single overshot (outrepasse') flake was identified. Twenty-five (17%) of the complete flakes are elongate in form and 122 (83%) are ovate to ovate-expanding. The shape of the remainder could not be determined because they are sufficiently incomplete. It should also be noted that approximately seven of the flakes were inadvertently split longitudinally during the knapping process.

Complete or partial platforms (Table 6) are found on 178 specimens (29% of the debitage). Fifty-three (29%) exhibit flat platforms, six percent (n=10) exhibit faceted platforms, and 52 percent (n=93) exhibit point platforms. Twenty-one flakes (3%) exhibit crushed platforms, and one exhibits a flat but angled platform. One hundred ninety-eight (32%) pieces of debitage are decortication efforts while 377 (61%) of the debitage pieces are considered to be general shaping/thinning flakes (those flakes with one to three exterior surface flake scars that lack a faceted platform and/or a lip at the interior flake surface margin of the platform). Later reduction stage biface-thinning flakes (those flakes with one or more exterior surface flake scars

Table 6: Flake Platform Morphology (SP-1, SP-2, TU-1 Debitage Combined).

| MANA designation | Flat | Faceted | Point | Crushed | Flat-angled | Count |
|---|---|---|---|---|---|---|
| RCCS6 | 1 | | 1 | | | 2 |
| RCCS11 | 1 | | 2 | | | 3 |
| RCCS38 | 26 | 2 | 56 | 14 | 1 | 99 |
| RCCS50 | 15 | 7 | 25 | 5 | | 52 |
| WCCS1 | 1 | | 2 | | | 3 |
| YBCCS42 | | | 2 | | | 2 |
| YBCCS57 | 8 | 1 | 4 | 2 | | 15 |
| YBCCS58 | 1 | | 1 | | | 2 |
| | 53 | 10 | 93 | 21 | 1 | 178 |

Table 7: Size Grade and Weights for Unmodified Debitage (SP-1, SP-2, TU-1 combined).

| | Size Grade | | | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MANA designation | *1* | *weight (g)* | *2* | *weight (g)* | *3* | *weight (g)* | *4* | *weight (g)* | *5* | *weight (g)* | *Count* | *weight (g)* |
| RCCS6 | | | | | 2 | 1.7 | | | | | 2 | 1.7 |
| RCCS11 | | | | | 5 | 4.36 | 1 | 0.16 | | | 6 | 4.52 |
| RCCS38 | 8 | 160.1 | 93 | 338.06 | 251 | 161.79 | 31 | 5.42 | | | 383 | 665.37 |
| RCCS50 | 3 | 78.79 | 32 | 106.73 | 141 | 82.13 | 3 | 0.38 | | | 179 | 268.03 |
| WCCS1 | | | 1 | 2.04 | 5 | 1.98 | | | | | 6 | 4.02 |
| YBCCS42 | | | | | 2 | 0.87 | | | | | 2 | 0.87 |
| YBCCS57 | 4 | 75.03 | 8 | 50.38 | 11 | 8.9 | 2 | 0.26 | | | 25 | 134.57 |
| YBCCS58 | 1 | 25.35 | 3 | 11.31 | 9 | 8.77 | 1 | 0.16 | | | 14 | 45.59 |
| | 16 | 339.27 | 137 | 508.52 | 426 | 270.5 | 38 | 6.38 | 0 | 0 | 617 | 1,124.67 |

*Table 7 counts include three potlid "flakes"*

Table 8: Morphology by Size Grade of Unmodified Debitage (SP-1, SP-2, TU-1 combined).

| | Complete Flakes | Broken Flakes | Flake Fragments | Shatter | Count |
|---|---|---|---|---|---|
| Size-Grade 1 | 9 | 0 | 3 | 4 | 16 |
| Size-Grade 2 | 30 | 7 | 14 | 86 | 137 |
| Size-Grade 3 | 92 | 22 | 28 | 281 | 423 |
| Size-Grade 4 | 16 | 2 | 1 | 19 | 38 |
| Size-Grade 5 | 0 | 0 | 0 | 0 | 0 |
| | 147 | 31 | 46 | 390 | 614 |

*Table 8 counts do not include the three potlid "flakes"*

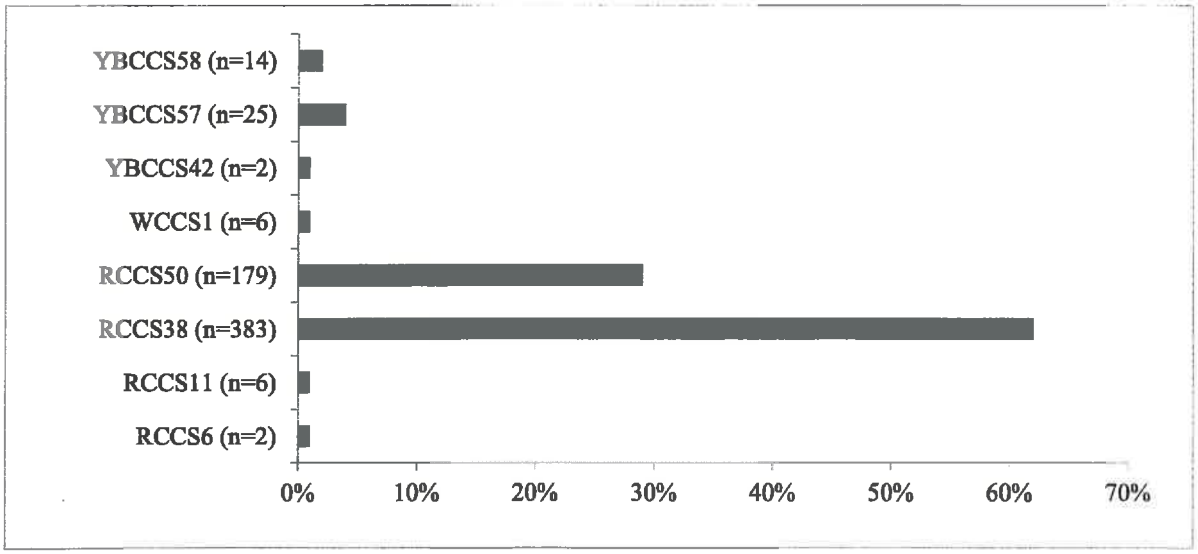


Figure 6: Count percentages by MANA designation for 24ME1105 unmodified debitage.

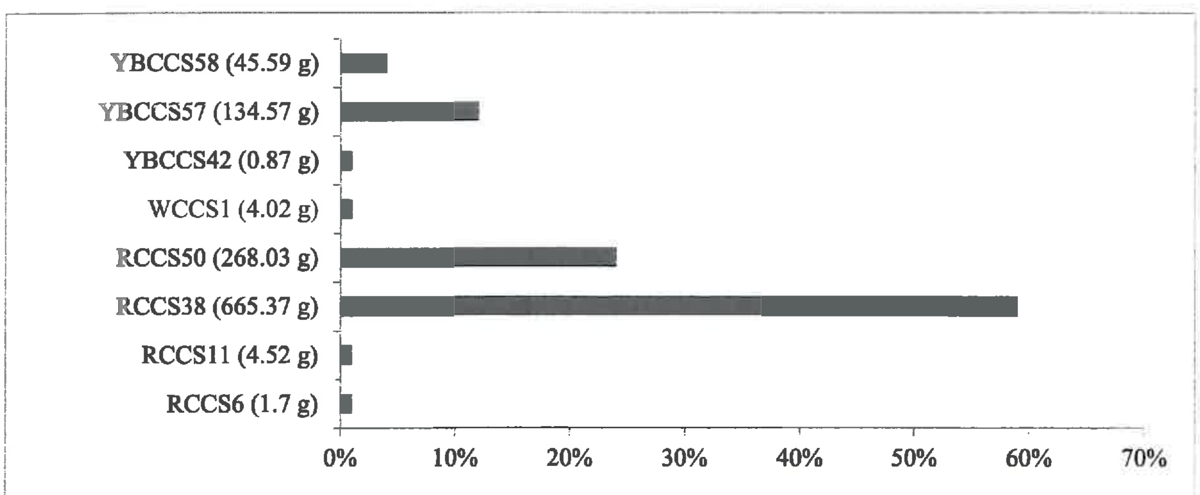


Figure 7: Weight distribution by MANA designation for 24ME1105 unmodified debitage.

that exhibit a faceted platform and/or a lip at the interior flake surface margin of the platform, and generally larger than Size-Grade 3) comprise 15 percent (n=27) of the diagnostic pieces. Possible finishing flakes account for only seven percent (n=13) of the diagnostic flakes. The majority of flakes exhibit subtle bulbs of percussion, and understated shock wave ripples. This may imply soft hammer percussion work as opposed to hard hammer percussion. Future work should include an effort to locate possible hammerstones in site 24ME1105 to better test this observation.

Mass analysis (Table 7) illustrates the dominance of Size-Grade 3 pieces (69 percent or n=426), with Size-Grade 2 pieces representing a distant second (22 percent or n=137). Pieces in the largest size grade (SG1) makeup three percent of the debitage (n=16) and pieces in the smallest recovered size grade (SG4) account for six percent (n=38) of the pieces. The latter, of course, may be an inaccurate representation because ¼ inch mesh was used to screen the excavated sediments and many very small pieces could have been missed.

The unmodified debitage clearly suggests that initial edging of bifacial cores and initial preparation (cortex removal and production of large primary reduction stage flakes) of non-standardized or opportunistic cores occurred within 24ME1105 and more specifically in, or very near, the TU-1 locality. The lithic raw materials occur as float and in bedrock exposures throughout the general site area. Its knappability is generally marginal in that it shatters more then it allows for controlled, conchoidal breakage. The stone reduction focus appears to have been on decortication, initial shaping of unprepared cores and bifaces, then small and medium-size flake production and the production of Stage II bifaces or quarry blanks. Pressure flaking of formal tools, in fact pressure flaking in any form, was very limited. The desired products may have been small to medium-size flakes, and medium-size stage II bifaces produced from large flakes. The debitage does not suggest production of highly refined bifaces or even resharpening of refined bifaces and only a couple of the flakes show careful preparation and grinding of faceted platforms. Knapping mistakes such as stacking or other flake removal problems are very limited attesting to a high level of knapping skill considering the marginal quality of the raw lithic material.

Two pieces of debitage are worth describing apart from the previous analysis (see Figure 5). One (catalogue #64) is a Size Grade 2 primary reduction flake fragment of the RCCS38 MANA designation. One small post-production flake was removed from the interior surface using the 90° fractured edge as a platform. Subsequent minor retouch-type flaking occurred in a diametrically opposed direction to the first flake removal at the distal edge of the flake fragment. The second piece (catalogue #65) is made on a Size Grade 2 secondary piece of shatter. It also is of the RCCS38 MANA designation. Three post-production small flakes were removed sequentially (laterally) from one side using the 90° fractured edge as a platform.

### 2.1 Minimum Analytical Nodule Analysis

Applying the MANA approach substantiates what the debitage analysis concluded. Site 24ME1105 was a temporary stopping point where past Native American occupants collected the locally available chert and produced early reduction stage bifaces, bifacial cores, and unprepared cores with the goal of flake and quarry blank production. The desired products were then transported to areas outside of the TU-1, SP-1, and SP-2 localities for future use.

The collection of artifacts shows a nearly equal preference for multi-directional/opportunistic flake cores over bifaces. Five of the assigned MANA units (RCCS6, RCCS11, WCCS1, and YBCCS42) have no associated cores or tools. Three MANA units, however, include debitage, cores and/or bifaces, and MANA unit RCCS50 includes two DEF/M. These three MANA units also have the most associated debitage (Table 9). Little more can currently be said regarding the human populations that formed site 24ME1105. Until more is known about the site it is impossible to use the available chipped stone data to make suggestions regarding precontact land use strategies (Knell 2012).

Table 9. 24ME1105 MANA units and associated artifact classes.

| MANA designation | projectile point/preform | hammerstone | graver | endscraper | biface | core | DEF/M | debitage |
|---|---|---|---|---|---|---|---|---|
| RCCS6 | | | | | | | | 2 |
| RCCS11 | | | | | | | | 6 |
| RCCS38 | | | | | 3 | 2 | | 383 |
| RCCS50 | | | | | 1 | 1 | 2 | 179 |
| WCCS1 | | | | | | | | 6 |
| YBCCS42 | | | | | | | | 2 |
| YBCCS57 | | | | | | 3 | | 25 |
| YBCCS58 | | | | | | | | 14 |

## 3.0 SUMMARY AND CONCLUSIONS

In general, site 24ME1105 is a locality where precontact occupants collected the locally exposed chert and largely produced flakes and quarry blanks. It needs to be determined if the cultural remains in site 24ME1105 retain contextual integrity or represent a mixture of multiple assemblages. A discussion of component specific lithic reduction strategies is currently not possible but may be with future investigative work in the site to determine if stratification of the cultural remains exists. Also, domestic activities in TU-1 do not appear to be represented based on the lack of firecracked rock, formal stone tools such as endscrapers, and bone implements. How that translates to the remainder of site 24ME1105 is unknown.

In addition to flake and bifacial quarry blank production surprisingly small flakes were intentionally removed from some of the chert cores as well as two pieces of debitage. This seems to be a pattern that persists over time in the northern Plains (e.g.,Brumley and Rennie 1993, Davis and Rennie 2017, Rennie 2017, Rennie and Hughes 1998). It may indicate that small flakes had as much utility as larger flakes, at least for some applications. Site 24ME1105 is within a few miles in several directions of better quality toolstone. Still, the marginal quality of the lithic material in 24ME1105 shows that for the precontact occupants of the region, better quality toolstone may have meant less from a pragmatic point of view then an aesthetic perspective held by contemporary knappers. The site also reiterates patterns from other similar sites that show a lack of interest in toolstone conservation.

Finally, heat treatment above 450° F (232° C) may improve the quality of the local lithic raw material in knapping applications, but additional experimentation is needed to determine this. One question the debitage raised is what caused the moderately high frequency of potlids? An experiment in heat-treating using temperatures up to 450° F (232° C), as well as a subsequent experiment to determine effects of a wildland fire on the chert material, did not result in a single potlid or even crazed-type fracturing. In fact, direct exposure to very high temperatures ruined the knappability of the experimental chert samples. Another question is whether soft or hard hammer percussion work was occurring in the site. This might be answered with future investigations that look for possible hammerstone materials. Until then, the analysis presented here can be used to guide future research in site 24ME1105.

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## Appendix 1: Minimum Analytical Unit Analysis (MANA) Categories:

### Cryptocrystalline silicates (includes microcrystalline silicates)

This category includes cryptocrystalline and microcrystalline varieties of highly siliceous sedimentary rock (silicon dioxide) referred to by Frondel (1965:171) as chalcedonic silica. Commonly used names for materials that would fall under this category include agate, chert, chalcedony, flint, jasper, opalite, carnelian, sard, sinter, some forms of silicified sediment, silicified limestone, silicified peat, and silicified wood. Because of the great variability among cryptocrystalline and microcrystalline silicates, the following categories are organized with reference to the primary color of each piece of material described.

***light yellow to light brown***

YBCCS42

*General*: Pale yellowish-brown (10YR 6/3 [approx..]).
*Munsell Color Notation*: !0YR 6/3 (approximate)
*Translucency*: opaque
*Luster*: earthy
*Texture*: microcrystalline (slightly grainy looking)

YBCCS57

*General*: Yellow (10YR 7/8) with pale-yellow banding. Exterior weathers to a dusky red.
*Munsell Color Notation*: See above description
*Translucency*: opaque
*Luster*: grainy to slightly waxy
*Texture*: microcrystalline and generally brittle and hard to knap

YBCCS58

*General*: Yellow (10YR 7/10) with brown (7.5 YR 5/6-4/6) banding. Exterior weathers to a dusky red.
*Munsell Color Notation*: See above description
*Translucency*: opaque
*Luster*: grainy to slightly waxy
*Texture*: microcrystalline and generally brittle and hard to knap

***pink to dark red***

RCCS6

*General*: Dark red (7.5R 3/4) with lighter red (7.5R 5/8) mottling. Some specimens contain infrequent, small dark inclusions.
*Munsell Color Notation*: see above description
*Translucency*: opaque to slightly translucent
*Luster*: vitreous to resinous
*Texture*: cryptocrystalline

RCCS11

*General*: Reddish-brown highly siliceous material with whitish-gray cloudy areas.
*Munsell Color Notation*: 5YR 4/3 (primary)
*Translucency*: moderately to highly translucent
*Luster*: vitreous
*Texture*: cryptocrystalline

RCCS38

*General*: Dusky red (7.5R 5/8-4/8) with occasional dark red to pinkish-white banding.
*Munsell Color Notation*: See above description
*Translucency*: opaque
*Luster*: grainy to slightly waxy
*Texture*: microcrystalline and generally brittle and hard to knap

RCCS50

*General*: Pale red (7.5YR 5/8-4/8) with dusky red spots and occasional bands or pale-red or dark-red.
*Munsell Color Notation*: See above description.
*Translucency*: opaque
*Luster*: waxy to slightly resinous
*Texture*: cryptocrystalline to microcrystalline; mostly brittle and hard to knap

***white to brownish-white to grayish-white-to beige***

WCCS1

*General*: Highly siliceous material that abruptly changes colors from whitish (10YR 8/1), to light gray (5YR 7/1), to yellowish-brown (10YR 5/6), to weak red (2.5YR 5/2) with occasional red (2.5YR 4/6) to dusky red (10R 3/3) streaks, swirls, and splotches, and occasional gray specks throughout the matrix.
*Munsell Color Notation*: See above description
*Translucency*: slightly translucent
*Luster*: waxy to vitreous
*Texture*: cryptocrystalline to fine crystalline

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