# Evaluating Inter-Observer Variability in Field Coding of Chipped Stone

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## ABSTRACT

For the last several years, survey along the Greybull River drainage, in the Greater Yellowstone Ecosystem in Northwestern Wyoming, has undertaken in-field analysis of over 30,000 stone tools and debitage. Since this is part of a non-collection project, assessing the level of accuracy of the lithic coding data is essential. These data will help determine which aspects of lithic coding need to be emphasized during future training sessions and which hold the highest interpretive validity. Data for this assessment were collected by having 15 members of the 2005 field crew code 25 lithic pieces individually, then in teams of two, in a field lab setting. The second set of lithic data consisted of 10 artifacts located across a site surface. These artifacts were coded individually by the crew members. An experienced field researcher coded all the lithic material for a set of control data. The results indicated a discontinuity between the element, portion, and colors of artifacts coded. There were slight variations between measurements of the lithic material coded. The more complex artifacts had the most variability. In conclusion, variability exists in the data collected and must be taken into account during analysis and interpretation. These data will be valuable in training the crew for the next field session.


## Introduction

During research conducted in the Greater Yellowstone Ecosystem in Northwestern Wyoming, along the Greybull River drainage, lithic artifacts were coded using a system that identified the class, element, portion, material, colors and inclusions, heat, measurement type, length, width, thickness, and cortex amount, of each piece. Acronyms of two to four letters were used to identify certain characteristics of the artifacts (see figure 2). The element determines if the chipped stones are flakes (FK, FKU, FKW), angular debris (ANG or ANGU), bifacial (BF), nodules (ND), cores (CR) or projectile points (PP). The portion category recorded whether there was a platform or not (PT or PTN) or if the piece was complete (CO). In the case of angular debris, the portion was unspecified (US). The majority of material types in this region were chert (CH), quartzite (QT), silicified sediment (SLS), obsidian (OB), and chalcedony (CL). Heat effects on the artifacts may consist of a potlid (PL) or thermal fracturing (TFR). Mitutoya digital calipers were used to attain the measurements in millimeters. All data were entered into an iPAQ PDA using an Excel file.

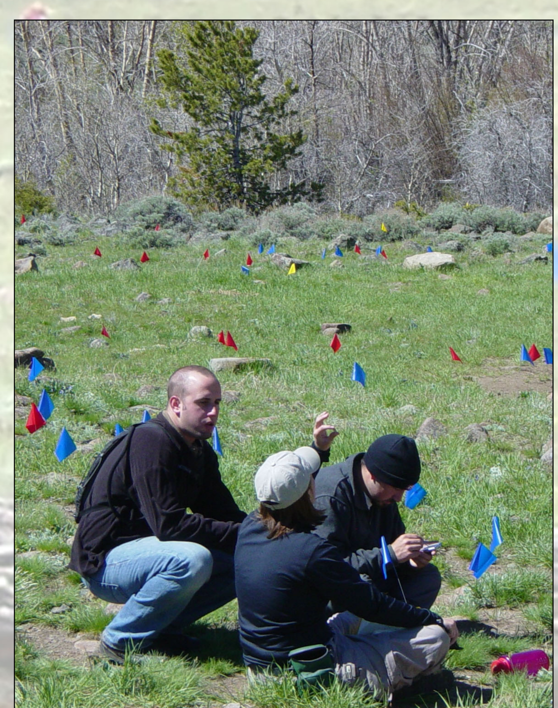

Figure 1

Pictured here are three field crew members coding lithic artifacts. Photo taken by Arielle Cheshire, 2005.

***Element/artifact***

| | |
|---|---|
| ANG | Angular debris |
| ANGU | Edge-damaged angular debris |
| ANGW | Worked angular debris |
| BF | Biface |
| BF2 | Minimally flaked biface |
| BF3 | Regularly flaked biface, edge irregular |
| BF4 | Margins regular, thinned |
| BF5 | Final biface |
| CR | Amorphous core |
| ES | End scraper |
| FK | Flake |
| FKU | Edge-damaged flake |
| FKW | Worked flake |
| GR | Graver |
| NDT | Tested nodule |
| NDU | Edge-damaged nodule |
| NDW | Worked nodule |
| OF | Other formal tool |
| PL | Potlid |
| PP | Projectile point |
| SC | Scraper |
| SS | Side scraper |
| UF | Uniface |
| US | Unspecified |

***Portion***

| | |
|---|---|
| CO | Complete |
| DS | Distal |
| DSH | Distal plus over half complete |
| END | End |
| FR | Fragment |
| LT | Lateral |
| ME | Medial |
| N | None |
| PR | Proximal |
| PSH | Proximal plus over half complete |
| PT | Platform bearing |
| PTN | Non-platform bearing |
| US | Unspecified |

***Color***

| | |
|---|---|
| BK* | Black |
| BR* | Brown |
| BU* | Blue |
| CL* | Clear |
| CM* | Caramel |
| GN* | Green |
| GR* | Gray |
| MR* | Maroon |
| N | None |
| OR* | Orange |
| PC* | Peach |
| PK* | Pink |
| PR* | Purple |
| RB* | Red-brown |
| RD* | Red-brown |
| TN* | Tan |
| WH* | White |
| YL* | Yellow |
| QTC | Quartz crystal (inclusions only) |
| **T | Transparent |
| **S | Semi-transparent |
| **O | Opaque |
| US | Unspecified |

***Raw Material***

| | |
|---|---|
| BS | Basalt |
| CH | Chert |
| CL | Chalcedony |
| DMC | Dollar Mountain Chert |
| DMQ | Dollar Mountain Quartzite |
| IR | Irish Rock Chert |
| MAD | Madison Formation Chert |
| MS | Metamorphosed shale |
| NDMC | Not Dollar Mountain Chert |
| OB | Obsidian |
| PWD | Silicified wood |
| QT | Quartzite |
| QTC | Quartz crystal |
| QTM | Morrison Formation Quartzite/Siltstone |
| SLS | Silicified sediment |
| US | Unspecified |
| VO | Unspecified igneous |

Figure 2

The codes listed above were used in the field while documenting the lithic artifacts. These same codes were used for the evaluation of the field crew's lithic coding abilities. This list was provided by Paul Burnett.

## Methods

Data for this assessment were collected by having 15 members of the 2005 field crew code 25 lithic pieces individually, then in teams of two, in a field lab setting. The lithic pieces were chosen from a collector's pile located at site JC057. Each piece was separately bagged and given a number. All of the JC057 pieces were coded inside a tent, while seated at a table, by the individuals and teams. The second set of lithic data consisted of 10 artifacts located across the surface of site PA2790. These artifacts were coded individually by the crew members. The PA2790 pieces were coded outside, where they were located, flagged, and numbered. An experienced field researcher coded all the lithic material for a set of control data. The pieces from site PA2790 were coded during the field session, by the experienced field researcher. The JC057 pieces were coded by the experienced field researcher 11 weeks after the field session, inside a laboratory.

## Results

Coding variability existed in the element, color, and measurements of the lithic artifacts. The element angular debris (ANG) showed the most variability with 86% of the pieces coded incorrectly. 57% of angular debris were coded as flakes (FK). Figure 5, artifact ***c***, is an example of angular debris coded as a flake. 29% of the angular debris had 50% of the crew coding for ANG and 50% coding for FK. Flakes with edge damage (FKU) or that were worked (FKW) indicated variability. 65% of the FKU or FKW were coded as FK by at least 43% of the field crew. 35% of the FKU pieces were coded as flakes by at least 50% of the coders. The most difficult elements to identify were bifacial (BF), nodule (ND), and core (CR). JC057-26 (figure 6, artifact ***h***) was a bifacial artifact with 7% of the crew coding for a BF. 64% of the crew coded the piece as a flake, 14% coded for angular debris, and 14% coded for a projectile point. PA2790 #10 was a tested nodule (NDT) with 30% of the crew coding it correctly, 30% of the crew coded it as a nodule (ND), 30% identified the artifact as a rock (RK) with an element code of unspecified (US), 30% coded the piece as a core (CR), and 10% coded for a flake. JC057-86 (figure 6, artifact ***j***) was a core with 36% of the crew coding it correctly, 29% coded for a tested nodule, 14% coded for a worked nodule, 14% coded for a nodule, and 7% coded for a utilized nodule.

Color variability existed with the red and tan color families. 78% of the nine, red color family artifacts indicated variability, as depicted by figure 3. 63% of the eight, tan color family pieces showed variability, as seen in figure 4. The width of the lithic artifacts showed the most variability between measurements. 63% of the artifacts coded had a variance of at least two millimeters. 41% of the variance was due to one measurement being drastically different from the others. 36% of the variance was due to crew members taking a technological measurement for complete (CO) pieces which had the width long than the length. 46% of the length measurements were varied by at least two millimeters. 44% of the variance was due to technological measurements. 13% was due to one measurement being drastically different from the rest, and 13% was due to difficult pieces such as the core and nodule.

Data entry errors were another result in this study. Five lithic artifacts were coded with incorrect item numbers. On four occasions, an artifact was coded as a complete piece but, was recorded as taking a clast measurement instead of a technological measurement. This error did not interfere with the actual measurements taken and recorded.

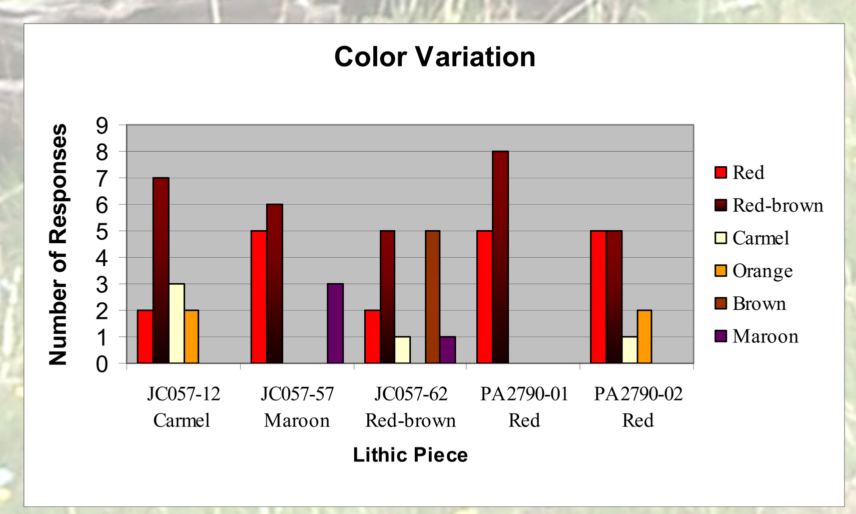


Figure 3

This is a graph depicting the coding variability based on color, among seven lithic pieces, in the red color family. These pieces came from sites JC057 and PA2790. All were coded individually by crew members.

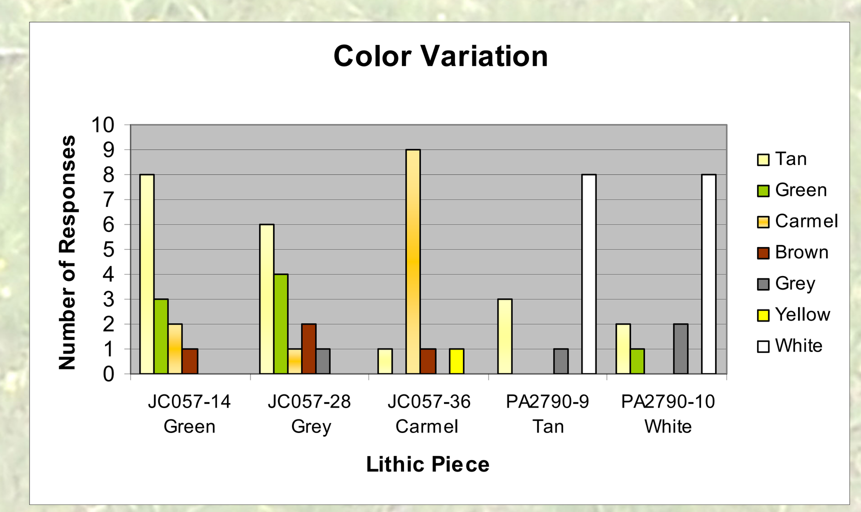


Figure 4

This graph is showing the color variability among the tan color family, as obtained from coding the lithic artifacts. These pieces came from sites JC057 and PA2790. All pieces were coded individually by the crew members.

## Conclusion

There was variability with angular debris, edge-damaged pieces, identifying platforms, measurement of widths and lengths, and colors. Some data entry problems occurred in the controlled field lab setting, which indicates, it is probable data entry errors occurred in the field. A possible solution to color variability is to create a color chart to be used in the field, by the field crew. Having a reference could eliminate the subjective errors of naming colors. Also, combining color groups such as red and red-brown would help to alleviate any confusion in subtle differences. It seems necessary to emphasize certain aspects of lithic coding during training sessions. Greater practice with and understanding of the element and portions of chipped stone would decrease the variability among these categories. The areas in most need of attention are identifying angular debris, platforms, and edge-damage, and increasing the crew's abilities to conduct width measurements.

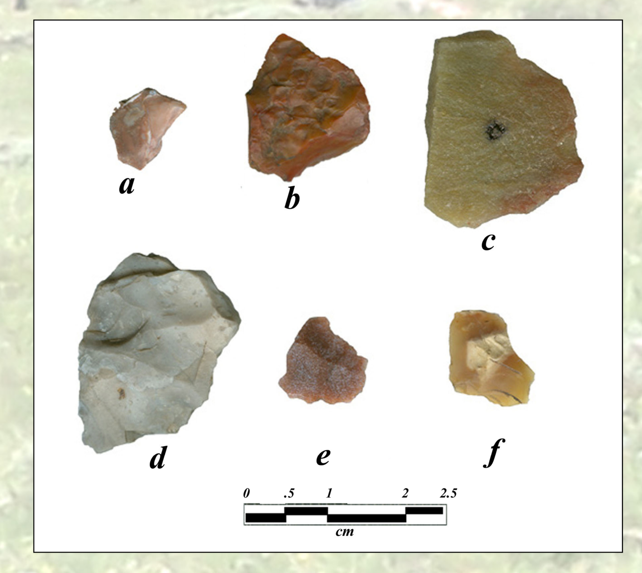


Figure 5

This picture is some of the artifacts coded by the field crew. They are all from site JC057. Artifact ***a*** is JC057-72, ***b*** is JC057-12, ***c*** is JC057-14, ***d*** is JC057-36, ***e*** is JC057-52, and ***f*** is JC057-62.

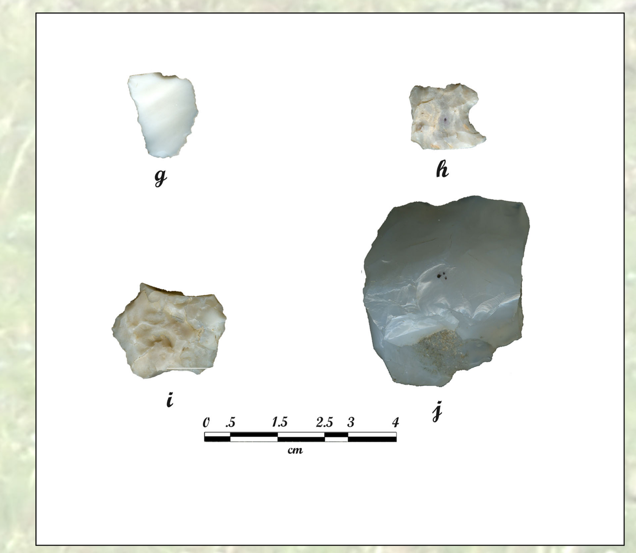


Figure 6

This picture is of artifacts from JC057. Artifact ***g*** is JC057-11, ***h*** is JC057-26, ***i*** is JC057-28, and ***j*** is JC057-86.

## Future Research

Continued research is recommended for this project. In the future, it would be helpful to collect data at the beginning of the field season and again at the end. This would provide an understanding of how the field crew's coding abilities improve and change over time. Another suggestion is to record the time of day the lithic pieces were coded. Daylight, temperature, and levels of tiredness may affect the coding process. Finally, it would be of use to indicate which of the team members did the identification of the lithic pieces and which member recorded the data into the iPAQ PDA. Indication of whether the team members communicated with each other during the coding process or if only one person identified each piece will provide a better comparison between the individual data collected and the team data.


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