PREHISTORIC FLAKES OR MODERN ROAD GRAVEL? DISTINGUISHING CULTURALLY SIGNIFICANT LITHIC MATERIAL FROM MODERN GRAVEL BYPRODUCTS

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The purpose of this article is to highlight the difficulties associated with differentiating culturally significant flaked lithic material from modern gravel fragments at roadside archaeological sites. Utilizing experimental archaeological techniques, this article provides suggestions on how to use contextual information and other relevant clues to identify flakes. Experiments of this kind have been done in the past, and this article expands upon the types of observations archaeologists should be making at potential prehistoric archaeological sites.

Fractured stone can resemble culturally modified flaked lithic material. Because stone fractures conchoidally, numerous natural and human-made forces can produce material similar to intentionally flaked stone. Geological processes can cause rock to fracture in ways that may be mistaken for cultural modification; however, this article focuses on the unintentional fracture of rock by heavy equipment. Through experimentation, we demonstrate how heavy machinery can fracture stone commonly utilized for tool making in ways that resemble flint-knapped flakes and cores.

BACKGROUND

Differentiating between natural and culturally significant flaked stone was first recognized as a problem in the late 1800s and continues to be an issue at sites around the world. Possibly the earliest account was in 1885, when George Ercol Sellers of Bowlesville, Illinois studied the fracture of stones produced by the tires of wagons and conducted his own experiments by crushing rocks under pressure. In 1939, Alfred S. Barnes published his article on differentiating between natural and human flaking, to create a guideline for assessing lithic material using the measurement of the angle of the platform-scar. Barnes found that flint-knapping is more likely to create platform-scar angles that are acute rather than obtuse (Barnes 1939:109).

Numerous experiments have been conducted to illustrate how similar nonculturally modified material is to intentionally flint-knapped flakes. For example, the University of Michigan Museum of Anthropology sent loosely packed cobbles and angular fragments of obsidian through the mail and found that flaking occurred due to the forces and pressure of the stones moving over each other as they circulated through the U.S. Postal Service mail delivery system (Luedtke 1986:55).

In another example, Bradbury found that rock crushers produce chert road gravel in ways that mimicked flakes, but that the differences in weights and thicknesses between flint-knapped and mechanically produced chert flakes were statistically significant (Bradbury 2001:245).

Despite numerous experiments and over 100 years of research on tool making, mistakes are still being made when differentiating between unintentional and culturally modified flakes. Patterson attributes this continued problem of identification to too few archaeologists in the United States receiving good training in lithic technology (Patterson 1983:297). We hope that this experiment can contribute to the accurate identification of lithic material.

Figure 1. Parent rocks placed on gravel road in path of 20-metric-ton John Deere 200D CL masticator. Photo by C. Cheverko; all other photos are by A. MacKinnon except as otherwise noted.

MATERIALS AND METHODS

Standard forestry management practices often utilize heavy equipment. In this experiment, large chunks of obsidian (Glass Mountain), basalt (Gold Lake), chert (Plumas National Forest), and quartzite (Plumas National Forest) were selected and placed on an unpaved road surface to mimic conditions in the forest (Figure 1). The exterior of each stone was marked with indelible ink (Figure 2). A 20-metric-ton

Figure 2. Artificial Gold Lake basalt flakes, dorsal side. Note the natural cortex and artificial cortex marked by red ink.

John Deere 200D CL masticator was driven over the samples one time forward and one time backward (Figure 3). Samples were collected for analysis.

RESULTS

The crushed remains of the four material types were collected, washed, and sorted into three categories (shatter, flakes, and cores) according to specific criteria. A flake must have all four of the following criteria:

- a ventral side and a dorsal side,
- a proximal end with a striking platform,
- a distal end with a termination, and
- compression waves or lateral fissures.

When the proximal end of the flake is broken but the specimen retains all other features, it is considered a broken flake and thus sorted into the flake category. To be determined a core, the specimen must have a minimum of two flaked surfaces and some visible patterning to the flake scars such as bifacial flaking. After sorting, the materials were weighed to calculate percentages by category for each material type.

Figure 3. Parent rocks crushed by 20-metric-ton John Deere 200D CL masticator. Photo by C. Cheverko.

Table 1: Percent of material type by weight after sorting into three categories.

Material Type	Shatter Percentage	Flake Percentage	Core Percentage
Obsidian	50	14	36
Basalt	51	16	33
Chert	81	14	5
Quartzite	86	14	--

DISCUSSION

The crushed stone was sorted into the three categories (shatter, flakes, and cores) and weighed (Table 1). The percentages of shatter, flakes, and cores were similar for each of the material types selected, likely a result of two common factors: stone fractures conchoidally, and each stone was subjected to the same type of force. The majority of material analyzed was shatter, making up at least 50 percent of total sample weight. Flakes made up 14-16 percent across all raw material types. Cores had a range of between 0 and 36 percent. The relationship between shatter and core percentages is most similar for obsidian and basalt. The obsidian and basalt material resulted in many large specimens, the majority of which could be considered fragmented blade cores. A very limited number of cores were bifacial; in fact, only one obsidian specimen resembled a bifacial core.

The flakes produced in the experiment are most similar to bifacial thinning flakes and pressure flakes, with a smaller representation of primary flaking (Figures 4 through 7). This results in the appearance of a range of flakes from all stages of biface reduction. A very small percentage of these flakes can be considered blades (Figures 8 and 9).

The excessive force applied to the material by the masticator resulted in signs that these samples were created by machinery rather than by hand. Much of the material appears crushed, especially at flake platforms where force is initiated (Figure 10). The possible core fragments also have many crushed

Figure 4. Artificial Gold Lake basalt flakes, ventral side.

Figure 5. Artificial chert flakes, dorsal side.

Figure 6. Artificial chert flakes, ventral side.

Figure 7. Artificial quartzite flake, dorsal side.

Figure 8. Artificial Glass Mountain blade, dorsal side.

Figure 9. Artificial Glass Mountain blade, ventral side. Note the compression waves.

Figure 10. Artificial quartzite flake, ventral side. Note the damage to the platform.

platforms that are indicative of excessive force. Obsidian was the most responsive to excessive force, which produced pronounced compression waves and eraillure scars (Figures 11 and 12).

When questioning the origins of flakes and cores in the field, consistent signs of crushed features can be indicative of excessive force from heavy machinery.

CONCLUSION

The ability of heavy machinery to produce false lithic scatters as a result of crushing material in the field is supported by this experiment. The four raw materials chosen produced debris that is so similar to debitage produced during the various stages of bifacial reduction that it would be difficult to discern one from the other. This presents issues to archaeologists working in areas known to have logging, roadside, and fire suppression activities, all of which utilize heavy machinery. Whenever assessing flaked stone in the field, it is crucial to consider the overall context and history of an area and to take into account the effects of heavy equipment on the environment. This experiment also supports the management practice of protecting known lithic sites from heavy machinery in order to avoid the further reduction of materials at such sites.

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Figure 11. Artificial Glass Mountain obsidian flakes, dorsal side. Note the flake scars.

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Figure 12. Artificial Glass Mountain obsidian flakes, ventral side. Note the eraillure scar on the larger flake.

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