Results from the Continued Lithic analysis of the Sunrise Ridge Borrow Pit site (45PI408)

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“What are the selective conditions under which a particular stone tool industry becomes fixed in mountain environments?”

Cost - refers to the amount of energy required to produce a given performance; including the construction of the original artifact.

How Cost and Performance Variables Inter-relate

What are the selective conditions under which any particular stone tool industry becomes fixed in mountain environments?

**Cost**
- Material Acquisition
  - Distance between source and manufacture locations
  - Raw Material
  - Raw Material Form
- Material Preparation
  - Failure Rates
  - Predictability of Failure
- Manufacture
  - Physical Properties
  - Tool Requirements
  - Technology
- Tool Durability

**Performance**
- Physical Properties
- Tool Requirements
- Technology
All lithics ¼ inch and larger

Excavated from 12 1x1 meter units across 4 excavation blocks.

A total of 2,321 artifacts that were ¼ inch or larger were excavated and analyzed from 2011-2013.

This 2,321 were combined with all artifacts ≥0.07 g from earlier 45PI408 excavations/analyses, n=3,672 lithic sample size.
Size Class Comparison

Platform Type

- Cortex
- Simple
- Faceted
- Bifacial Unfinished
- Bifacial Unfinished, Wear Present
- Bifacial Finished
- Bifacial Finished, Wear Present
- Potlids
- Not Applicable
- Pressure flakes
- Technologically Absent

□ < 1/4"
□ >= 1/4"
Size Class Comparison

Thermal Alteration

- No Heating
- Lustrous/Non-Lustrous Flake Scars
- Lustrous Flake Scars
- High Temperature Alteration

- < 1/4"
- ≥ 1/4"

%
Variation Across Space

Feature Comparison → Excavation Block Comparison → Site Quadrant Analysis
The 60.5N excavation block had many features, including a large feature spanning the two northern most units.

305 artifacts were associated with this feature.
Feature Analysis

### Fragment Type

<table>
<thead>
<tr>
<th>Type</th>
<th>61.5N Feature 1</th>
<th>Non Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biface</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flake/Flake Fragment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chunk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Material Type

<table>
<thead>
<tr>
<th>Type</th>
<th>61.5N Feature 1</th>
<th>Non Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chert</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obsidian</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Igneous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Thermal Alteration in 60.5N Area

<table>
<thead>
<tr>
<th>Type</th>
<th>61.5N Feature 1</th>
<th>Non Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Healing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lustrous/Non-Lustrous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lustrous Flake</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Excavation Block Comparison

30 North

60.5 North

64 North

71.5 North
### Tephra Layers

<table>
<thead>
<tr>
<th>Tephra Layer</th>
<th>Approximate Age (Years BP)</th>
<th>Grain Size (mm)</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mt. St. Helens W</td>
<td>470 BP</td>
<td>&lt;1.0</td>
<td>White sand-sized pumice</td>
</tr>
<tr>
<td>Mt. Rainier C</td>
<td>2,200 BP</td>
<td>15</td>
<td>Brown pumice scoria and lithic lapilli</td>
</tr>
<tr>
<td>Mt. St. Helens P</td>
<td>3,000 BP</td>
<td>&lt;1.0</td>
<td>White to light gray sand to silt sized ash</td>
</tr>
<tr>
<td>Mt. St. Helens Yn</td>
<td>3,500 BP</td>
<td>1.0</td>
<td>Yellow coarse sand-sized pumice and several fine-grained layers</td>
</tr>
<tr>
<td>Mt. Rainier F</td>
<td>4,800 BP</td>
<td>1.0</td>
<td>Light colored clayey ash and scattered lapilli</td>
</tr>
<tr>
<td>Mt. Mazama O</td>
<td>6,850 BP</td>
<td>&lt;0.4</td>
<td>Orange to cream colored very fine sand to silt sized ash</td>
</tr>
</tbody>
</table>

Tephra layers noted at 45PI408 during excavation. Dates and characteristics adapted from Mullineaux (1974 and 1986) and Vallance and Scott (1997).
### Point type

<table>
<thead>
<tr>
<th></th>
<th>Complete</th>
<th>Fragment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wallula Rectangular Stemmed</td>
<td>II</td>
<td>IIII</td>
</tr>
<tr>
<td>Columbia Corner Notched</td>
<td>I</td>
<td>IIII</td>
</tr>
<tr>
<td>Rabbit Island Stemmed</td>
<td>I</td>
<td>I</td>
</tr>
</tbody>
</table>
Further investigation into raw material types shows a wide variety of chert as different fine grained volcanic material.

Different varieties of chert:

Igneous artifacts observed:
Lake Sediment cores indicate increased fire frequency in late Holocene
Lithic technological and functional variation across space and through time is subtle.

The selective conditions at 45PI408 are more representative of the harsh environment, and changes in environmental zones, than any settlement and subsistence strategy taking place at lower elevations.

The presence of large cores at the site suggests there are likely unknown raw material sources nearby.

There is a mix of curated and expedient technologies present at the site, but formal technologies are dominant.
Analyze the remaining portions of the lithic assemblage (≤ 1/4”).

Identifying the presence or absence of local raw material sources.

Use all of the data from 45PI408 in combination with other sites to build a lithic lineage (e.g. Lyman and O’Brien 2000 and 2002) of the entre White River watershed.
Acknowledgements

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