Elemental Analysis of Basaltic Materials from the Little John Site (KdV06), Yukon Territory, Canada

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Introduction

This research reports on the utility of portable X-Ray Florescence (pXRF) technology to distinguish intra-site variability of a large sample of archaeological basaltics recovered at the Little John site (KdVo6) both within and between components dating from the Late Pleistocene to the Late Holocene.

Figure 1. Little John Site Location in relation to other late Pleistocene – Early Holocene sites in Eastern Beringia mentioned in the text. [4. KaVo-2; 5. Little John; 6. Gerstle River; 7. Healy Lake; 8. Poulton Station; 9. Swan Point; 10. Broken Mammoth/Mead] (Easton and MacKay 2008)

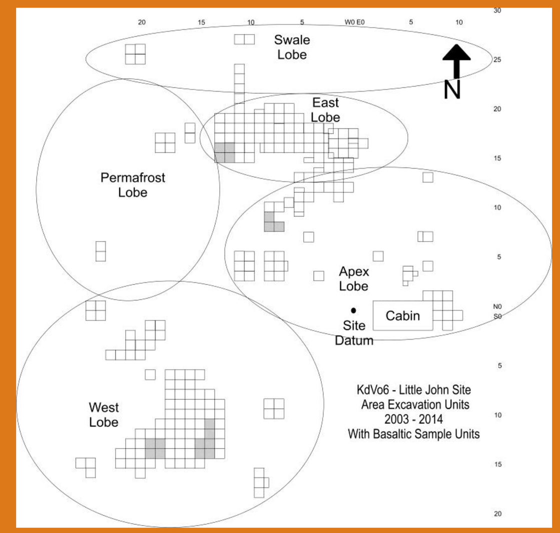

Figure 2. Controlled Area Excavation Units at KdVo-6, 2003-2014 with Sample Units.

The Little John site is located in the most easterly reaches of the former landmass known as Beringia (Figure 1). The site assemblage is comprised of multiple components, spanning the Late Pleistocene, c. 14,000 years ago to the most recent Historic past (Easton et al. 2007, Easton and MacKay 2008, Easton et al. 2011). The large areal extent of the site encompasses several distinct "lobes" with different geomorphic and taphonomic regimes and social-cultural function (Yesner et al. 2011)(Figure 2).

Research Questions

Our principle interest was to assess whether geochemically distinct basaltic materials, are distinguishable through the application of pXRF technology. Of additional interest were questions related to continuity of basaltic source material through time (Figure 3). Finally, the empirical results of this study are used to make important observations about intra-site variability of uses of basaltic through time and across the site.

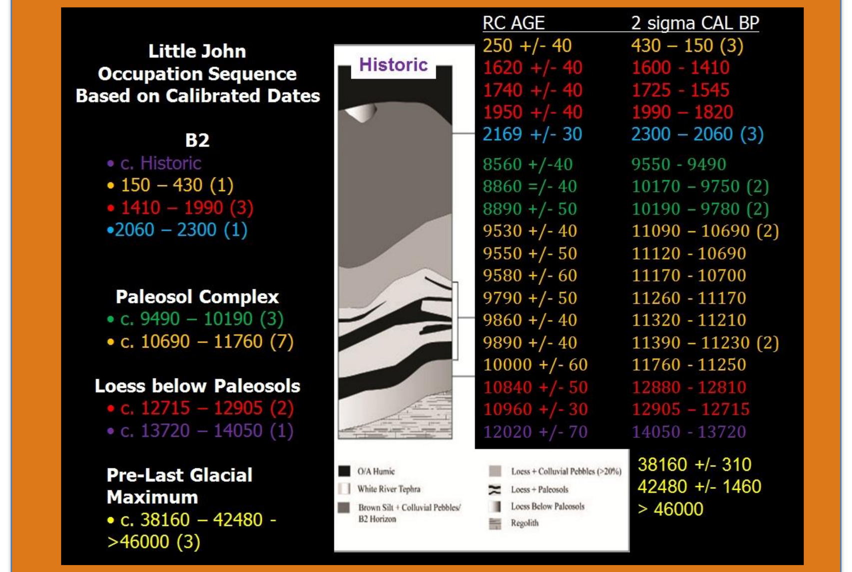

Figure 3. Little John Occupational Sequences Based on Calibrated Dates (Easton et al. 2014)

Results

Group delineation was determined by principle component analysis (PCA) (Figure 4) and further explored by the aid of bi-plots and scatterplot matrices (Handley 2013). PC1 constitutes 61.6% of the total assemblage variation and PC2 consists of 17.2% for a total of 78.8%. In sum, eight potential basaltic groups were suggested by this analysis.

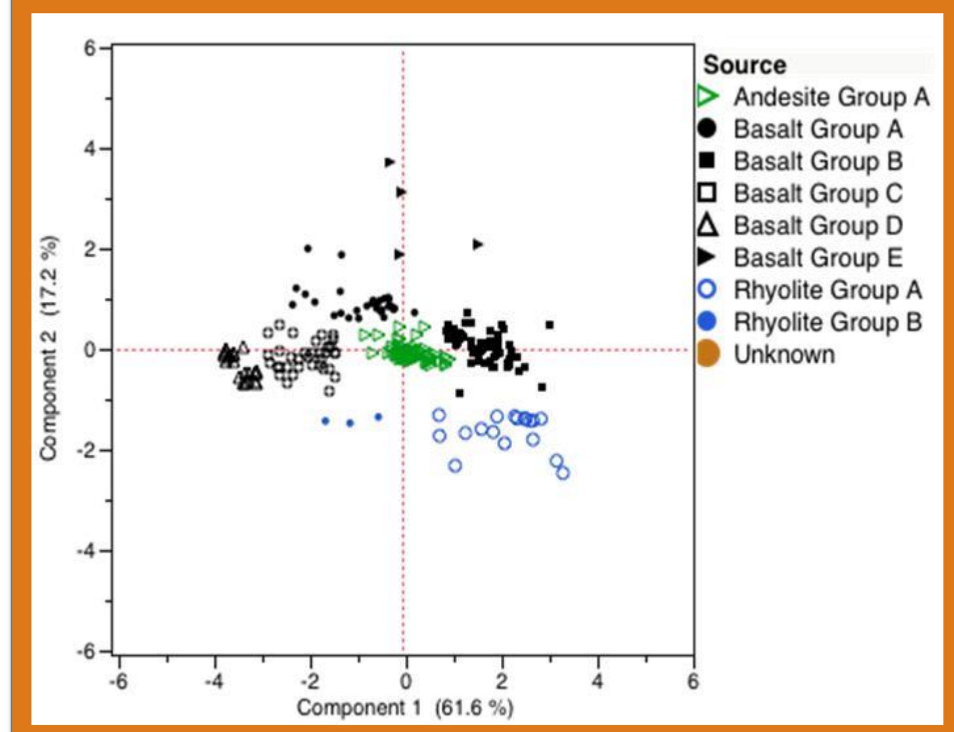

Figure 4. PCA Exhibiting Proposed Lithic Group Assemblages

Figure 5. Andesite Group A Lithic Sample

Figure 6. Basalt Group B Lithic Sample

Figure 7. Basalt Group D Lithic Sample Assemblage

Andesite Group A, a black fine-grained possible andesite exhibiting visible quartz phenocrysts was the most visually and geochemically distinct group. A number of formal tools associated with the early Chindadn complex are composed of this material. Early significance and later proliferation of this material indicates local accessibility. Basalt Group B signifies another significant material distinguished based on its high frequency and peak during the early-mid Holocene. Basalt Group D is a very fine grained basaltic used to manufacture formal tools and most frequent during the Holocene period.

Overall, Figure 8 does not demonstrate an overt preference of basaltic material for lithic manufacture. However, Figure 9 suggests a high degree of temporal variation through time.

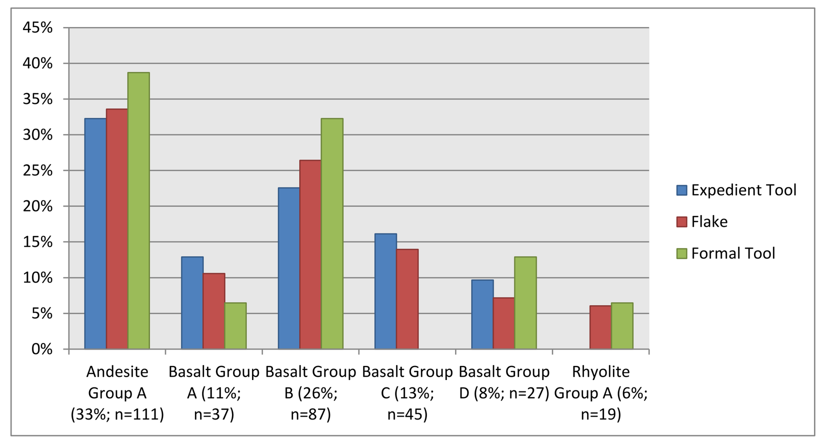

Figure 8. Distribution of Basaltic Material Type and Artifact Type

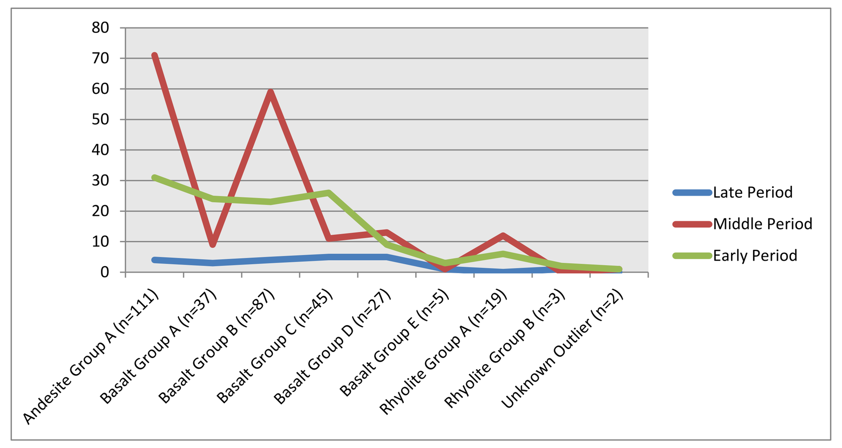

Figure 9. Use of Basaltic Material Type over Time by Raw Count

Materials and Methods

Analyses were conducted at the Laboratory of Archaeology at Simon Fraser University, Burnaby, British Columbia (Figure 11). The study employed a Bruker AXS Tracer III-V+ portable XRF spectrometer, equipped with a rhodium X-ray tube and (SiPIN) detector using a power setting of 40 keV and 15 uA with a 0.76 millimeter copper filter and a 0.0305 millimeter aluminum filter. Samples were emitted to the X-ray path for 180 live seconds. Ten elements were measured; Potassium (K), Manganese (Mn), Iron (Fe), Gallium (Ga), Thorium (Th), Rubidium (Rb), Strontium (Sr), Yttrium (Y), Zirconium (Zr), and Niobium (Nb). The S1calprocess obsidian calibration Excel sheet developed by Bruker and the University of Mussiori nuclear reactor was used to convert raw photon counts to parts per million (ppm).

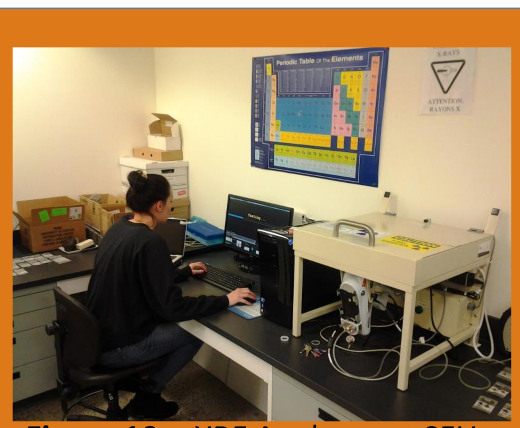

Figure 10. pXRF Analyses at SFU

The analyzed sample consists of lithic artifacts with basaltic recovered from two 2x2 m units both the East and West Lobes, 1x2 m in the West Lobe, and 28 basaltic formed tools from site (Figure 2).

Conclusions

This study has identified as many as seven different distinct elemental signatures on culturally modified basaltics used at the Little John site. Local knowledge has identified two prominent basaltic exposures that might be potential sources for this material. One is located at "hollering / echo lake", a small caldera located to the southwest of the confluence of Scottie Creek and Chisana River that several local *Dineh* have identified as a place where "Old People would go to get that rock to make tools" (Easton, n.d.).

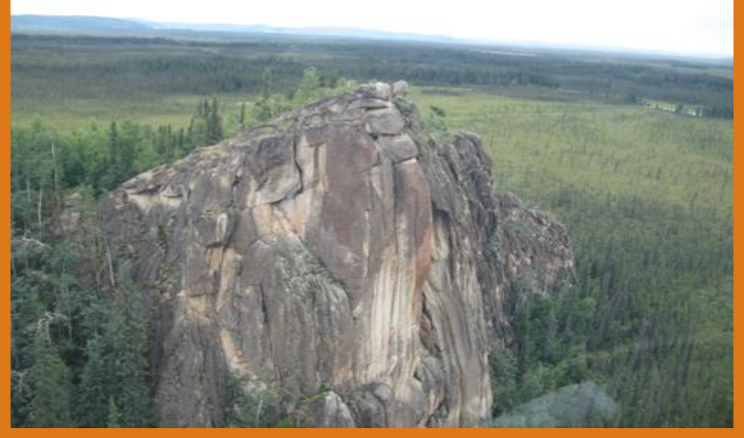

Figure. 12 Basaltic Outcrop in the Yukon-Alaska Borderlands

Another is a basaltic dyke located on the Yukon-Alaska border on the upper reaches of Snag Creek observed by Chief David Johnny of the WRFN (Figure 11). We have not had the resources to examine these potential sources – that is for the future.

References

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