Small Scale Subsurface Sampling as a Method for Identifying Anthropogenic Features through Sediment Analysis: A Case Study from Pend Oreille County, Washington

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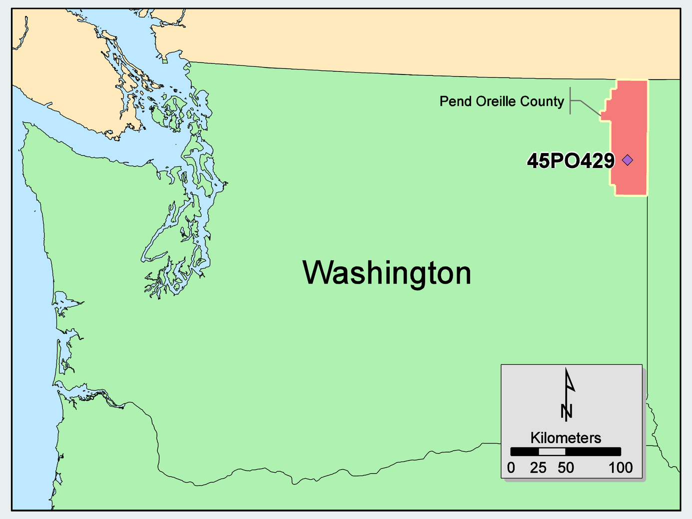
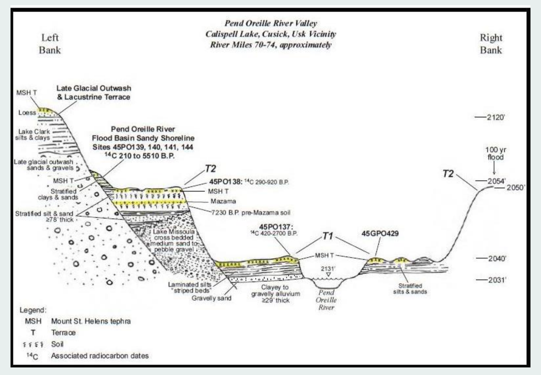
Introduction

Previous surveys identified over 100 depression features across the landscape of Frog Island (45PO429) (Dorwin 2014), begging the question of the best way to investigate the nature of these features. In this study we test the efficacy of coring in transects across presumed occupation features to assess if geoarchaeological analyses could reveal if they were suitable candidates for excavation. These inexpensive and relatively fast methods are more efficient than others in the CRM toolkit (e.g. excavating test pits), particularly in contexts where there may be little in the way of in situ cultural deposits. The utility of geoarchaeological augur coring can also be compared to other minimally invasive techniques such as resistivity probing and magnetometry.



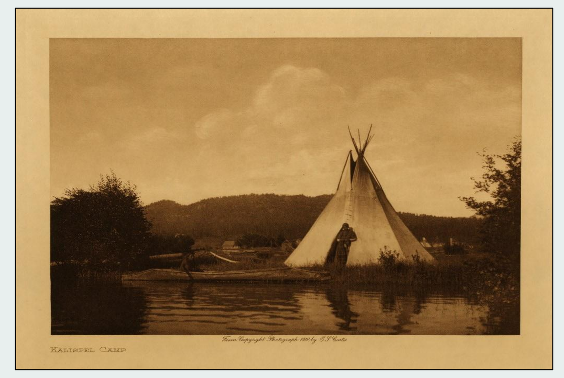
Washington state map showing the general project area.



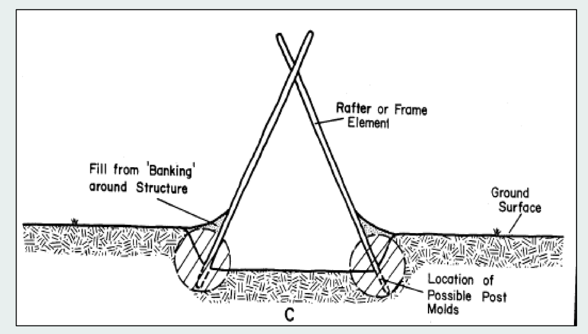
Schematic cross-section of the Pend Oreille Valley (Gough 2012:Figure 9).

Geographic Setting

Frog Island (45PO429) is a point bar on the east bank of the Pend Oreille River within the Kalispel Tribe of Indians' Reservation in northeastern Washington. While the Box Canyon Hydroelectric Project presently controls this part of the Pend Oreille, Frog Island is subject to annual submersion with the freshet. Gough (2012) determined that the point bar has existed for no more than 4200 years. The Pend Oreille River can be classified as a meandering river, and sediment typically erodes from where water velocity is greatest and is deposited under lower velocity conditions (Goldberg and Macphail 2006:91; Waters 1992:128). Sediment tends to accumulate on the convex banks, forming point bars like Frog Island. The base of Frog Island is formed by gravel accumulation overlain by coarse sands, with finer particles grading upwards. Vertical accretion deposits of silts and clay from overbank floods often overlay sequences of lateral accretion (Waters 1992:130-133; Brown 1997:70).



1910 photograph of a Kalispel tipi ("Kalispel Camp". Northwestern University Library, Edward S. Curtis's The North American Indian *2003).*



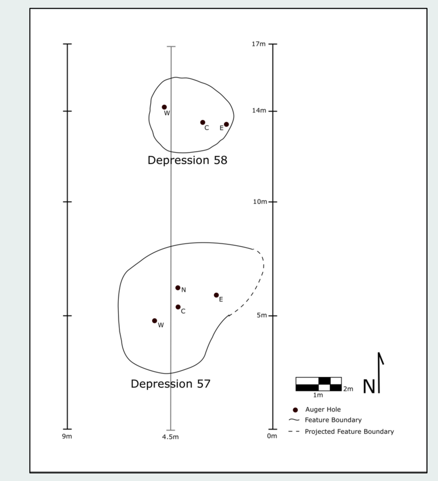
Cross section diagram of a dug-in tipi (Rice 1985).

Cultural Context

Historic and ethnographic records attest to the Kalispel's occupation of the area surrounding what is now known as Frog Island at the time of the first encroachment of Euro-Americans (Dorwin 2014). In the first half of the twentieth century the landform was utilized residentially, ritually, and economically as a place for fish entrapment. Residences included tipis: wood framed structures covered by matting, bark, or hide and surrounded by banked earth and/or placed in a pit (Truman 2014). The archaeological footprint of such dwellings is variable, from a marked depression for dug-in winter occupancy to a subtle leveling of the ground surface for summer occupancy. Excavated context from this occupation overlie the well-dated St. Helens "T" tephra (AD 1800) (Mullineaux 1996).

Prior investigations recovered chipped stone artifacts from the river bank documenting a pre-historic occupation at 45PO429 (Dorwin 2014). The only excavated context with a chipped stone point was radiocarbon dated to 100±30 BP (Dorwin 2014:77–79), however the site was bioturbated and the actual occupation could be earlier. Our investigations uncovered several micro flakes of cryptocrystalline silicate and small amounts of charcoal located through out the cores. Flakes were recovered from multiple strata, however none were present in offsite cores. Due to the presence of flaked stone we place the occupation of these pits in the prehistoric occupation of the site.

Depression 57 taken from Depression 58 following grass clearage, note flags outlining the perimeter of the depression.



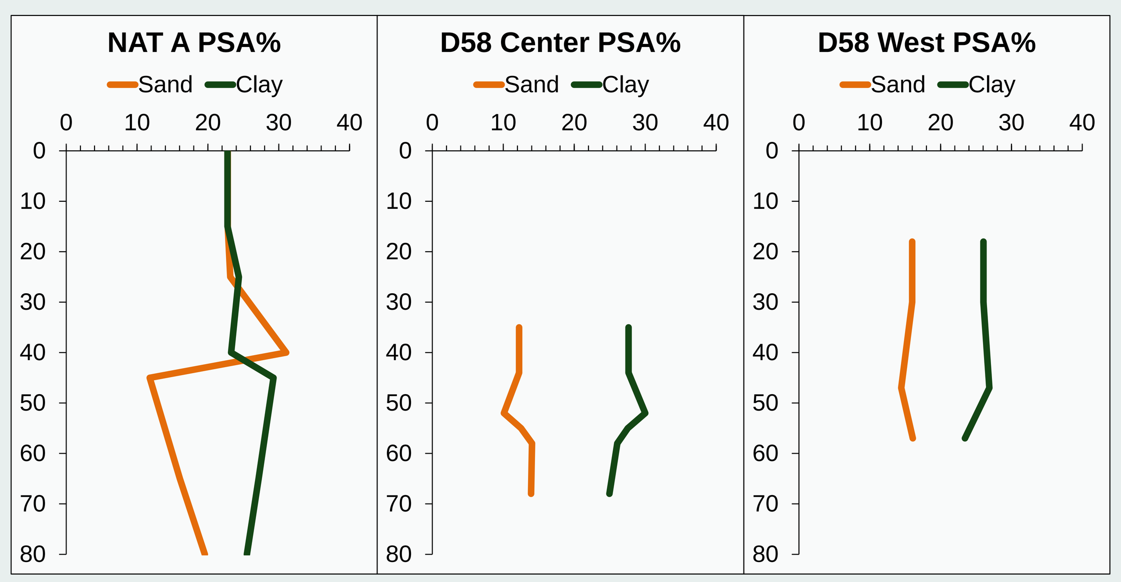
Plan map of Depressions 57 and 58, adapted from original by Brandon McIntosh.

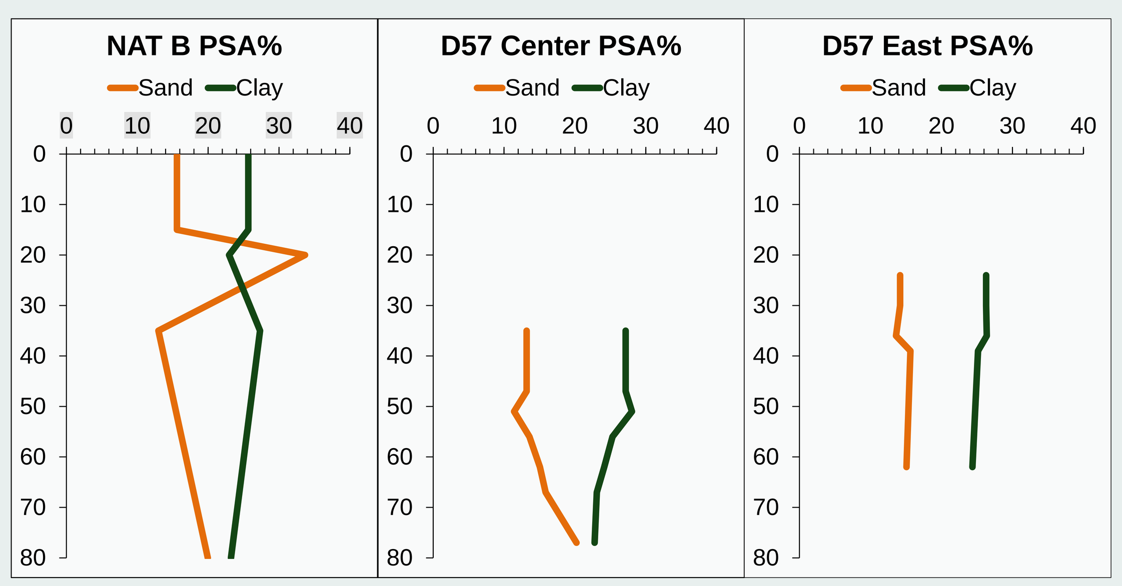
Methods

The data used in this analysis was collected in the summer of 2015 by students in a geoarchaeology course at Washington State University. Depressions 57 and 58 were identified by Dorwin's (2014) survey of the landform as ideal targets for further investigation. A bucket augur was used to collect sediment samples from a total of nine cores: three from Depression 58, four from Depression 57, and two off-site controls (WSU A ,WSU B). Omitting the overlaying sod layer, samples were taken in 2–5 cm increments down to at least 30 cm into the underlying mottled silt loam, which was identified as culturally sterile. Basic sediment description was undertaken in the field to assign each sample to a roughly defined stratigraphic unit based on color texture, etc.

Samples were further processed, described, and combined upon return to the Geoarchaeology Lab at WSU. Following strata designations large strata samples were fractionated using a 1 cm gauge riffle splitter and by cloning and quartering (Gerlach 2002). Analyses included pH and Electrical Conductivity by probe, loss-on-ignition to assess organic and inorganic carbon, and particle size analyses using wet sieving for coarse fractions, and laser diffractometry for fine fractions.

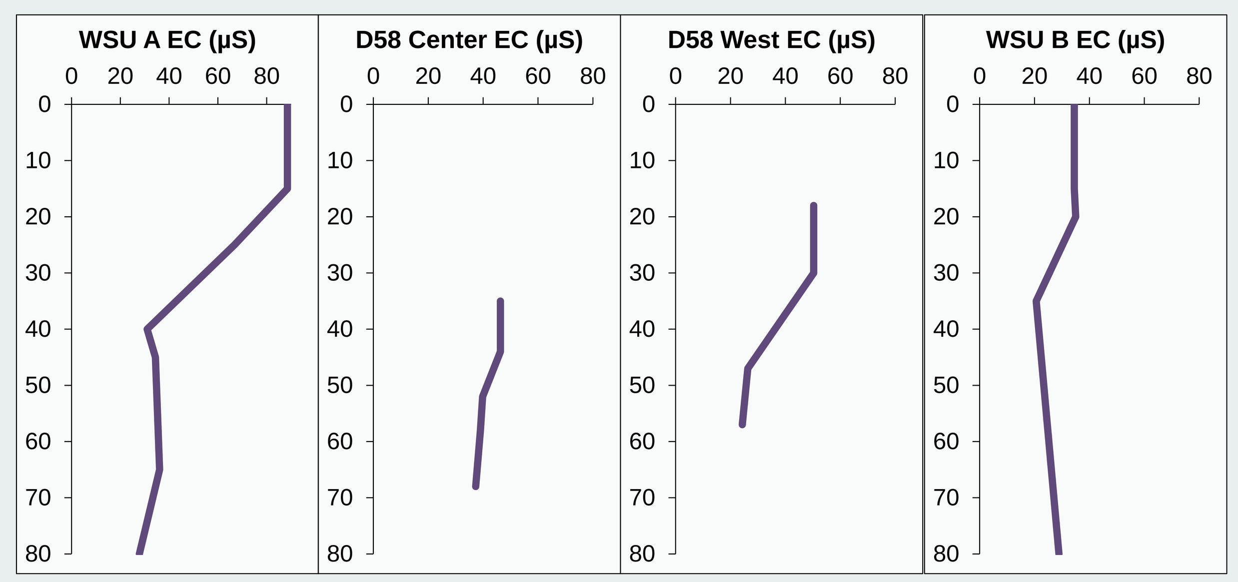
Identifying Anthropogenic Features through Coring

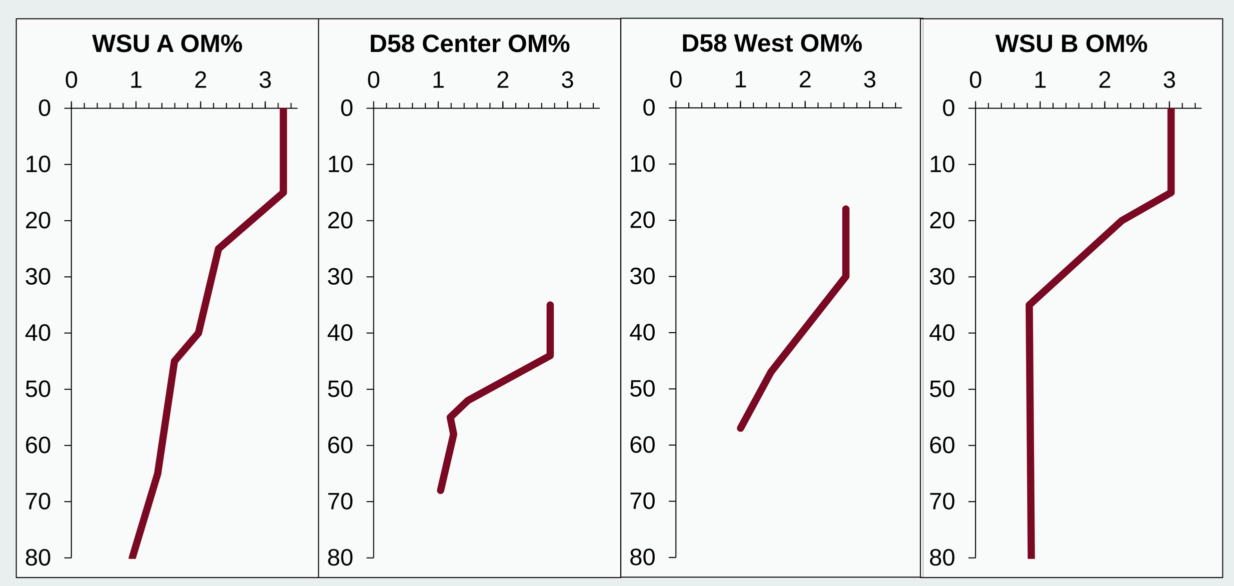




Comparison of the particle size distribution (PSA) between the off-site cores (WSU A, WSU B) and the cores taken from D57 and D58 reveals some stark distinctions which allow insight into the nature of these depressions as culturally modified features. The most obvious feature distinguishing the off-site PSAs is the sharp increase and decrease in sand (around 40 cmbs in WSU A). This is likely attributable to a fluvial depositional event (Brown 1997). However, this event is not represented in the cores from the depressions. Rather, we have clear evidence that humans removed or otherwise obscured this sandy stratum, perhaps as part of the preparation of the depressions for use as tipi bases or other features. This demonstrates, at a minimum, anthropogenic influence on this landscape in the past. Secondarily, the PSA data gives us insight into the possible antiquity of these depressions, regardless of whether or not they are anthropogenic features. A depositional event resulting in a relative increase in clay seems to be shown in all of the depression cores. The minor clay peak appears at varying depths across the features corresponding to the current surface shape of the depressions. This indicates that that shape was present at the time of that depositional event and that these two features were coterminous.

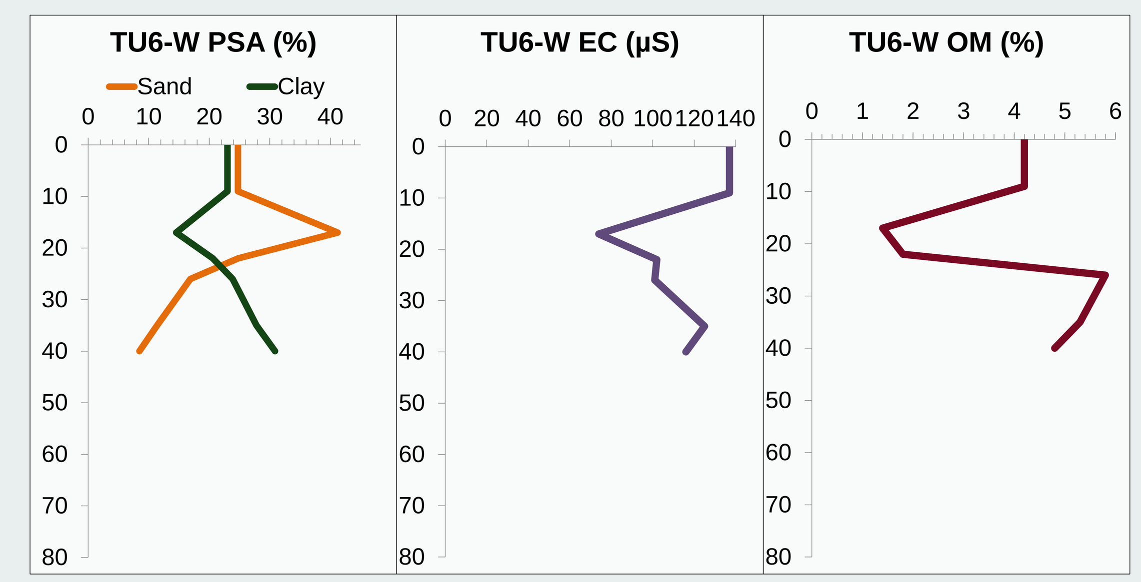
Are There In Situ Cultural Signatures?





Electroconductivity (EC) values for D58 West (24–50 µS) bracket the values recorded at D58 Center core (37–43 µS), and both fall into the ranges for off-site cores WSU A and B, as well as Trench 2 (Truman 2014). The OM for D58 parallels the trend of the EC and declines with depth. The cores demonstrate soil formation processes based on the high percentage of organic material that was detected by both EC and LOI in the top layers of the core profiles, and do not indicate organic enrichment of the interior of the depression features . The formation of an A horizon occurs as the surface vegetation decays and humic acids leach down the profile. D58 and D57 both show the same pattern of A horizon formation as demonstrated by the off-site cores. This absence of a cultural signature could be due to the lack of an interior burning feature in either of the depressions or the homogenization of the soil profile.

Comparison to Nearby Anthropogenic Deposits



Given the strong resemblance of our depression cores to the off-site controls, we compared our results to Truman's (2014) study of cultural deposits from excavations of the historic occupation on Frog Island. We selected one unit profile (TU6-W), a historic refuse burning location, as a comparison to for our cores because of the marked contrast evident in the soil analyses between this anthropogenic deposit and the more subtly human-influenced D57 and D58. TU6-W had fire-cracked rocks at the boundary between strata A and B and charcoal was present. The PSA data from TU6-W demonstrates a relatively shallow deposit that represents the same flooding event that deposited large quantities of sand in WSU A and WSU B. This shows that no soil removal occurred from the surface of TU6 where these historic deposits, unlike the D58 and D57 cores where this surface had been removed. In situ fire signature present in TU6-W is supported by the stark decrease in OM in the strata where the charcoal and burning was detected. It is clear that the fires also impacted EC, following a similar pattern to the OM. The anthropogenic signature demonstrated in TU6-W further support the hypothesis that our cores do not intersect any primary cultural deposits.

Discussion

The aim of cultural resource management is typically to produce data through minimally invasive and cost-effective methods which are often sufficient to support nomination to the National Register. On the other hand, such methods produce very limited data. This project aimed to address this tension through an auger core survey coupled with geoarchaeological analyses. Auger cores are frequently used for site identification, but the recovered deposits are rarely analyzed and frequently discarded. Yet, when collected systematically, core samples provide useful material for archaeological and paleoclimate reconstructions (e.g., Cannon 2000a, 2000b; Hallman et al. 2013; Jansen et al. 2013).

We demonstrate that geoarchaeological analysis of even a limited number of auger cores can provide insights into the natural and cultural processes at play in a particular locale. In some contexts a few well-placed cores can take the place of fully excavated test pits, particularly in contexts where there are likely to be few in situ features. These methods can also to supplement or replace other non-invasive techniques. For example, Dorwin (2014) performed a magnetometric analysis of D57 and D58. The results of this analysis were interpreted as evidence of buried features, though natural origins for the phenomenon are possible. We can't confirm or deny this using the limited data we collected, however we have determined that these two features are poor candidates for further investigation contra Dorwin (2014).

Acknowledgments

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References Cited

Brown, A. G.
1997 *Fluvial Geoarchaeology: Floodplain Archaeology and Environmental Change*. Cambridge Manuals in Archaeology. Cambridge University Press, Cambridge.

Cannon, Aubrey
2000a Assessing variability in Northwest Coast salmon and herring fisheries: bucket-augering sampling of shell midden sites on the central coast of British Columbia. *Journal of Archaeological Science* 27:725–737.
2000b Settlement and sea-levels on the central coast of British Columbia: evidence from shell midden cores. *American Antiquity* 65:67–77.

Dorwin, John T.
2014 *Box Canyon Hydroelectric Project Archaeological Evaluation of 45PO429*. Kalispel Natural Resources Department. Submitted to Public Utility District No 1 of Pend Oreille County.

Gerlach, R.W., D.E. Dobb, G.A. Raab, JM. Nocerino
2002 Gy Sampling theory in environmental studies. 1. Assessing soil splitting protocols. Journal of Chemometrics 16:321–328.

Goldberg, Paul, and Richard I. Macphail
2006 *Practical and Theoretical Geoarchaeology*. Blackwell, Malden, Massachusetts.

Gough, Stan
2012 *Geoarchaeological Investigations at Site 45PO429, Pend Oreille County, Washington*. Archaeological and Historical Services, Eastern Washington University. Short Report 1146. Submitted to Kalispel Tribe of Indians, Usk, Washington.

Hallmann, N., M. Burchell, N. Brewster, A. Martindale, and B. R. Schöne
2013 Holocene climate and seasonality of shell collection at the Dundas Islands Group, northern British Columbia, Canada—A bivalve sclerochronological approach. *Palaeogeography, Palaeoclimatology, Palaeoecology* 3:163–172.

Jansen, E.J. de Boer, A.M. Cleef, H. Hooghiemstra, M. Moscol-Olivera, F.H. Tonnejick, J.M. Verstraten
2013 Reconstruction of late Holocene forest dynamics in northern Ecuador from biomarkers and pollen in soil cores. *Palaegeography Palaeoclimatology Palaeoecology* 386: 607–619.

Mullineaux, Donal R.
1996 *Pre-1950 Tephra-Fall Deposits Erupted from Mount St. Helens, Washington.* U.S. Geological Survey Professional Paper 1563. U.S. Government Printing Office. Washington, D.C.

Rice, Harvey S.
1985 *Native American Dwellings and Attendant Structures of the Southern Plateau*. Report Number 100-4. Eastern Washington University Reports in Archaeology and History. Archaeological and Historical Services. Cheney.

Truman, Elizabeth Kathleen
2014 *Geoarchaeological Investigations at 45PO429 (Pend Oreille County, Washington).* Master's Thesis, Department of Anthropology, Washington State University, Pullman.