'FORT OF THE SPEAR SHAFTS' OR 'FARM HILL' - The Traprain Law Community And Environs Interpreted Through Botanic Remnants.

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ABSTRACT: The Iron Age/Roman hillfort site of Traprain Law, East Lothian (NT 58163 74443) presents a distinct absence of plant-based evidence despite an extensive excavation history. The latest of these investigations (1999/2000 excavation), recovered a number of organic residues (in approx. 20 samples) containing plant macrofossils and micro/macro charcoal and a block sample from the 'Pond/Tank' (Contexts – 3127, 3128) which enabled palynological analysis. This extended investigation undertook morphological analysis (incl. ring-counts, preservation assessments) and species identification plus secondary analysis via carbon and nitrogen isotopic methodology on the plant macrofossil and micro/macro charcoal and furthered interpretation of a previous unpublished preliminary pollen analysis. This extended investigation was intended to aid in the construction of a subsistence/resource profile for the Traprain Law site and to determine the nature and extent of agricultural practice and wider community-environment interactions. This was enabled through analysis of the plant macrofossil and micro/macro charcoal, which highlighted a subsistence profile weighted to cereal agricultural production and a wood-focused fuel profile, whilst also suggesting that the Traprain Law community may have been distant from direct environmental interaction and largely a consumer site. Further understanding of the nature of the wider Traprain Law environmental context was also an intended target of investigation, this was highlighted largely in the isotopic and palynological analysis. Traprain Law was an Iron Age site surrounded with agricultural clearance, sediments were fertile and, in some instances, potentially saturated and there was minimal arboreal cover evident. A wider comparative discussion was also developed, a comparison of the Traprain Law systems to plant-based profiles from published environs Zone 1 (<5km from Traprain Law) and Zone 2 (>5km-20km from Traprain Law) sites to contrast wider inter-site community-environment interactions. There are many different site-environment interactions within this collective of connected communities, and a definition for localised subsistence lifescapes emerges which includes both proactive and passive relationships to environments. The purpose of Traprain Law has never been clearly defined, and is still a diverse possibility, however regarding community-environment and environ inter-site interactions, Traprain Law is certainly more 'Farm Hill' than 'Fort Of The Spear Shafts'.

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The world either conspired against me or with me for this one. In a world where we were all isolated, what else could I do but write this thesis, and yet, in a world where it was quite literally impossible to go anywhere how did I write this thesis…

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Research has been a reason to carry on engaging with the world however distantly, and this has despite the times been a beautiful project, though at times challenging. Those that bore those challenges with me, my parents and friends, who have heard me talk of nothing else but Traprain Law for months, there are none in this world who are more dear. Special mention to my father, Mr. S. Tilley, who holds the title proudly apparently of my research assistant, there has been much last-minute fieldwork and he is also the only person besides myself to read this thesis. Until you that is…

Lastly, to the site of Traprain Law itself, it may seem strange to be expressing gratitude to a place, however this wonderful edifice of tumbled stone and earthworks, has held my interest easily for two years. So, to Traprain Law, and the many who wove her story before me and those who will undoubtedly do so after, thank you.

DEDICATION

This thesis is dedicated to all those who inspired and encouraged me not to pursue a sensible career, those that realised that my happiness would matter in the 9 to 5, although those hours are aspirational as any researcher knows. That noted I was happiest surrounded by dusty books, jumbles of stone that are definitely brochs or small hillocks that are aspirational roundhouses and communities of plants… and those that serendipitously informed me that, that was archaeology. Some of those wonderful, special people are no longer around for me to say thank you, so this is my thank you.

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1. INTRODUCTION

The assemblage considered both in regard to the literature review and the new Traprain Law summit data is extremely diverse, but in the case of the new data is also quite limited in quantity. The literature review focuses on plant macrofossil and charcoal residues from a range of sites within or associated with the East Lothian coastal plain. In regard to the literature review the key literature includes the Traprain Law Environs Project 2000-2004 (Haselgrove, Carne & Fitts: 2009), 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' (Lelong & Macgregor: 2008), 'An Iron Age Coastal Community in East Lothian' (Haselgrove, McCullagh & Crone: 2000) and 'An Inherited Place: Broxmouth Hillfort and the South-East Scottish Iron Age' (Armit & McKenzie: 2013). These works include details of some of the most impactful excavations in East Lothian and sites which epitomize Iron Age and Roman period settlement in the region and in wider Scotland. The first two texts mentioned are particularly discussed in this thesis as they explore periphery, hinterland and potentially satellite sites to the main Traprain Law summit community, it seems clear that in many instances the sites discussed in these texts had direct involvement with Traprain Law.

The new data or 1999/2000 Traprain Law excavation in terms of assemblage nature consists of plant macrofossils mainly cereals, substantial charcoal deposits, preliminary pollen investigation and secondary analysis consisting of carbon and nitrogen isotopic analysis on cereal grains and charcoal. The preservation overall of the 1999/2000 assemblage was poor, many residues when classified on the Hubbard & Al Azm (1990) scale varied from P4 'poorly preserved' to P6 'clinkered', despite this, specimens suitable for further analysis were recovered though not in great quantities. Samples were recovered from across the Traprain Law summit from a significant range of contexts including floor/occupation deposits, rampart-structure residues, potential midden deposits and most significantly the 'Pond/Tank' feature, which potentially had ritual significance. The key literature in regard to the 1999/2000 excavation assemblage includes the 'Traprain Law Summit Project, East Lothian' Data Structure Report 1999 (Armit et al: 1999) and the 'Traprain Law Summit Project, East Lothian' Data Structure Report 2000 (Armit et al: 2000) alongside unpublished excavation documentation and fragmentary reports/resources. Cereals were all measured/weighed, given a condition assessment and in the case of the previously unidentified 'Pond/Tank' context underwent identification to species level when possible. Charcoal from two contexts (Context 3127, Context 3117) was previously unidentified, these were sorted, genus/species identified, given a condition assessment and weighed. Where condition allowed further details such as tree-ring counts, pith, radial cracks, etc. were recorded. Across the specimens any with a P5 or P6 condition assessment were excluded from further laboratory-based analysis due to potential for contamination, in this case this further analysis consisted of carbon and nitrogen isotopic analysis. Plant macrofossil and charcoal analysis can potentially inform on species presence, growth details, grazing potential/intensity, fire histories, selective species management, agricultural practice, etc. (Birks & Mathewes: 1978) (Birks: 1984) (Souto et al: 2019). Preliminary pollen investigation was completed by the original excavation team and Durham University Archaeological Services, palynological analysis can potentially indicate species abundance, suggest at vegetation community dynamics and is an aspect closely related to anthropogenic environment interactions (Fyfe et al: 2017). Isotopic analysis of carbon and nitrogen in relation to organic residues, specifically those which are plant-orientated, can indicate aspects of plant growth and the conditions in which growth occurred. Beyond this it can suggest any anthropogenic involvement in the growth process, although the conclusions possible in this regard and in regard to effects on growth are contested. The relation for example between higher nitrogen content and higher yield has been demonstrated in some studies to be negative despite logical arguments previously contrary to this (Gröcke et al: 2020). The point here being that interpretation must take into account the current dilemma of conflicting data regarding aspects like nitrogen supplementation on plant growth, whilst the simplest interpretation is that higher nitrogen content equals higher yield and higher quality crop this is not necessarily the case, and this type of conflict continues throughout the Traprain Law isotopic analysis. The diversity of the assemblage has the benefit of providing a multi-proxy approach to vegetation community and environmental reconstruction, this should result in a more detailed and nuanced interpretation of the Traprain Law community situation within its environmental and vegetational contexts, and its interactions within these. Data typologies will first be considered in isolation then as a collective to determine if differing proxies agree on environmental dynamics.

The region of East Lothian originally Haddingtonshire is characterised by its 40 miles of enclosing coastline and predominantly rural nature closely associated with premium agriculture (Figure 1.1, 1.2). The region's main industry from the 19th Century onwards was arable agricultural production with lesser industrial investment in quarrying and mining enterprises (Groome: 1882-1885). Evidence exists for sustained habitation and settlement in East Lothian from prehistory onwards, archaeological remnants for later prehistory are particularly rich across the county. Geomorphological East Lothian has been shaped by millions of years of differential erosion of sedimentary versus igneous deposits, this has left chains of upstanding reliefs set in rolling fertile agricultural fields. Some of these reliefs like Traprain Law stand isolated within the landscape, making them logical sites for 'powerful' settlement (Figure 1.3). The main site of discussion and new contribution of data is that of Traprain Law, situated 2.4km south-south-west of the modern community of East Linton in East Lothian (Curle: 1915). Ultimately the main Traprain Law summit site has an extensive chronology of archaeological investigation the most extensive to date being the A. O. Curle and J. E. Cree 1914-1915 and 1919-1923 seasons, these focused on the western slope of the site an area of approximately 0.6ha (Curle: 1915; Curle: 1920; Curle & Cree: 1916; Cree & Curle: 1922; Cree: 1923; Cree: 1924). Limited excavations were also supervised by Cruden (1940), Bersu (Close-Brooks: 1983), Strong (1984) and there was also a Recovery Excavation following a wildfire incident (Rees & Hunter: 2000). Ultimately all that can be stated regarding site chronology is that evidence exists to suggest limited interaction/occupation in the Early Prehistoric (Neolithic/Late Bronze Age) with building activity at the site and permanent occupation evident in the Later Prehistoric period specifically the Late Iron Age/Roman Period, occupation continues in some aspect into the Medieval Period (13th/14th Century) although it is not clear if this occupation is constant (Rees & Hunter: 2000) (Jobey: 1976). The environment surrounding Traprain Law in the modern context is largely open agricultural fields with some scattered secondary woodland, this environment is relatively stable and has been consistent throughout the modern period.

Previously much of the archaeological research regarding the site of Traprain Law has been isolated and due to the extensive yet chronologically distant excavations unconnected. The various excavations have of course had differing focuses with much of the work of Curle and Cree (1914-1915, 1919-1923), the most prolific excavators of the site, being focused on defining the large defensive structures specifically the 'ramparts' on the summit, similarly these aspects of Traprain Law fascinated Cruden (1940). Later works have had a more artefact-based focus with various separate in-depth investigations into pottery assemblages and metalwork (e.g. Campbell: 2012, Burley: 1956). Much work remains to be done in regards to the internal summit structures of

Traprain Law and the other aspects of its assemblages, even after the 1999/2000 excavation work is considered. The 1999/2000 excavation focused on further defining spatially the nature of the Traprain Law summit site by establishing the nature and date of already recognised upstanding features and assessing the 'blank areas' between these features for content. The primary importance then of this research is that it adds in a tangible way to the understanding of the Traprain Law site, both broadly and more specifically as previously organics have been a neglected assemblage at the site. The earliest excavations at the site did not have the resources or necessary understanding of taphonomy to collect samples for the purpose of organic recovery, and later excavations either did not have this focus, have yet to publish results or were limited by preservation/recovery. Data which illuminates the vegetation communities surrounding Traprain Law like plant macrofossils, charcoal and pollen can provide information or suggestions on some of the most integral aspects of the Traprain Law community such as diet, interactions with environments, ritual aspects, trade, community interconnectivity, settlement status/power, etc. Currently the picture of the Traprain Law community in the Late Iron Age/Roman Period is of a high-status trade-orientated major stronghold with extensive foreign trade links within the Roman Empire. Aspects which have had very little consideration are for example the extent/nature of native trading links within the region and/or the nature of the Traprain Law environmental context itself. For all that we know about Traprain Law there is still so much that is unknown and will still remain unknown by the end of this thesis, but one major contribution of this research will be the grounding of this site within the dynamics of its environment and the network of sites within close locality. In a sense we know Traprain Law the international Roman ally, but we don't know the Traprain Law founded on local enterprise and in fertile lowland pastures. Another important aspect of this research is the placement of Traprain Law in a site-rich landscape, by including a literature review focused on smaller environs sites the relation of sites throughout the landscape to the Traprain Law focal point will be possible. This will not only further inform on the local connections of the Traprain Law community potentially but also allow an assessment of the nature and extent of inter-reliance, and perhaps reinforce previous conclusions of the high-status nature of the main Traprain Law summit site. This is an opportunity to assess, admittedly via limited proxies, an Iron Age-Roman period sites-landscape-environments dynamic. Certainly, in regard to East Lothian this has not been previously possible as areas with both focal sites and peripheral small sites, with an extensive excavated record have not existed in such a well-documented state. The research questions are separated into two groupings those associated specifically with the new Traprain Law summit data and wider discussion including the environs site data. The first grouping is as follows:

1. What is the nature and extent of subsistence and agricultural practice for the Traprain Law community?
2. What is the nature of the Traprain Law community fuel profile and what does this suggest about community-environment interaction?
3. What can be ascertained about the nature of the 'Pond/Tank' feature contexts and assemblages at the Traprain Law summit sites, specifically the nature or purpose of deposition?
4. What is the nature of the Traprain Law environmental context and its constituent vegetation communities?

The second section which has a broader discussion focus is as follows:

1. How did Traprain Law and the Zone 1 and Zone 2 environs sites interact with surrounding environments, how do these interaction decisions compare and contrast between sites?

This thesis begins with a comprehensive literature review collating profiles for fuel, cereal/farmed products and wild/subsistence products for sites situated within the East Lothian coastal plain or its periphery. These sites in many instances have direct visibility towards the main Traprain Law summit site or at least have accessibility to potential routeways/hollow-ways between sites. The sites included also fit the temporal and cultural context of the main Traprain Law site, in that they existed as communities simultaneously. In some instances, Neolithic/Bronze Age sites have been included as whilst settlement of Traprain Law had not occurred in this period, interactions within the space perhaps ritual in nature are evident. The sites which have been targeted for discussion also have the quality of an existing plant-based assemblage recovered during excavations, as this is the data analysed and discussed for Traprain Law herein. It is likely that some degree of interconnectivity existed between all the sites here discussed, consequently the nature of this network is one aspect analysed and interpreted. Following the extensive literature review the new data for Traprain Law from the 1999/2000 excavation is presented with detailed context notes and assemblage break-down. The descriptions of methodologies and processing are included in the presentation of the new data and analysis of that data. The first new data introduced is the 1999/2000 excavation cereal assemblage, followed by the charcoal, then weed seeds and then the preliminary pollen analysis. In this same section the laboratory techniques employed are discussed including the carbon and nitrogen isotopic methodologies and results. This concludes the new data introduced by this thesis. Next is a discussion section focused exclusively on the interpretation of the new Traprain Law data organised by research question, the first grouping as previously defined. This section concludes with an evaluation as to the limitations of the assemblage and analysis, and ultimately what significance the new data has to wider study. What follows is another discussion section but this time providing a space for comparison between those datasets discussed in the literature review and the Traprain Law data. This section also concludes with an evaluation of the data limitations and the significance of the questions asked. The final section of this thesis is of course a wider conclusion in which the main findings are summarised, significance and limitations of the data/approach reinforced and areas for further research noted.

The complexity of the Traprain Law site is evident even with the morphology of its name, the first instance of the term 'Traprain Law' appears to be datable to the late 18th Century and was borrowed from a local settlement. Etymologically it is a curious cultural litmus, a Cumbric name derivative from the Welsh 'tref' meaning farm and either 'pren' meaning tree or 'bryn' meaning hill, combined with 'law' an Old English append meaning hill. In this sense we have Traprain Law then the 'Farm Hill', an idyllic agriculturally prosperous centre, a food secure and generally flourishing community situated in a fertile verdant landscape (Fox: 2007). Before the C18th however on an AD 1630 map we find Traprain Law named Dunpendyrlaw, a name amended through time to become Dunpelder a name commonly used for the site by those locals with significant ancestry associated with the region. The name is also etymologically Cumbric, containing the Welsh 'din' meaning fort and 'pelydr' meaning potentially 'spear shafts', whilst the 'dun' is Scottish Gaelic meaning 'fort' (Fox: 2007). In Dunpelder then we find Traprain Law as 'Fort of the Spear Shafts' a far more confrontational name full of military power and suggestive of local might and resource control. These are contrasting images, and which is the more correct is potentially more a case of interpretation, it is liable that a discussion focused on plant remains is more likely to reveal a 'Farm Hill' than a 'Fort of the Spear Shafts'. However here we clearly see demonstrated the many faces of the Traprain Law site, and how the impression of the site upon the landscape and the communities within that landscape evolved across time.

2. <u>SITE BIBLIOGRAPHIC REVIEW</u>

2.1. Introduction - Bibliographic Review

All of the sites analysed are geographically associated with the East Lothian coastal plain, with all sites having some geographical association to the study site of Traprain Law. The coastal plain itself is premium agricultural land, with sustained evidence of habitation from prehistory onwards, intensification of archaeological remnants however coincides with the Iron Age (Haselgrove & Fitts: 2009). The landscapes of East Lothian reflect millions of years of differential erosion of varied sedimentary and volcanic deposits. To the north of the Southern Upland Fault, resistant igneous rocks have formed areas of upstanding relief, these form crag-and-tail landforms eroded by glacial scouring (Whitbread et al: 2015). A particular example of this is Traprain Law itself which is an intrusive Laccolith of phonolite formed during volcanic activity, an uncommon material in Scotland (Figure 2.1). The various areas of sedimentary concentration appear to be focuses of agriculture, or at least particularly prosperous agriculture, this is a trend noted elsewhere in prehistory where agricultural production follows geological boundaries focused on sedimentary deposits (Wildgoose: 2016) (Figure 2.2). East Lothian is not particularly rich in coal deposits, although there are shallow coal beds previously evidenced around Prestonpans and the availability/extent in prehistory of these coal beds could have been much greater. Along the base of the range of hills which include the Garleton Hills and Traprain Law is a band of rich arable and pasture land, with a yearly high yield upon which the reputation of East Lothian as an agriculturally productive county rests (Groome: 1882-1885). In contrast to the north of this bands of heavy yellow clay deposits on till/boulder clay are practically agriculturally barren, here in the 19th Century context the focus of production was timber i.e. oak, beech (Groome: 1882-1885). To the east of these deposits near Dunbar are some of the most fertile soils of the region, this includes abundant rich loam and some clays. Here the main arable products in the 19th Century were wheat, beans and potatoes (Dunbar Reds) (Groome: 1882-1885) (Figure 2.3). The East Lothian climate is agriculturally benevolent with the proximity of the extensive coastline preventing extremes in temperature. These characteristics have existed in the county for centuries, the sites mentioned here exist in a landscape which has across time been uniquely suited to high-yield systems of agriculture. Sites have been classified into zones with Zone 1 including those sites within the East Lothian coastal plain but not situated directly on the coast, these sites predominantly have direct lines of site to the Traprain Law main summit site (Figure 2.4). Zone 2 sites are those situated on the periphery of the East Lothian coastal plain or on the coast itself, these seem to have routes of travel towards but not visibility of the main Traprain Law site (Figure 2.5).

2.2. ZONE 1

(Figure 2.4)

2.2.1. Introduction - Zone 1

The East Lothian coastal plain encompassing Traprain Law and its environs has dominated much of the broader archaeological discussion for southern Scotland since the main Traprain Law site excavation 1914-1923 (Cree: 1923). This is ultimately a result of the areas sustained data contribution which includes the original Traprain Law excavation, the Environs Project (2000-2004), the Traprain Law Summit Project and indeed this article of archaeo-environmental research. The coastal plain, with its status as premium agricultural land, has certainly seen habitation from prehistory onwards but archaeologically intensification of occupation occurs in the Late Iron Age to the post-Roman period (Haselgrove & Fitts: 2009). All of the sites discussed within this section are present on the East Lothian coastal plain itself, as such are not coastline sites, and are defined as residing within Zone 1 of this study (Figure 2.4). For the purposes of this study Zone 1 encompasses all sites <5km distant from the main Traprain Law summit.

2.2.2. Whittingehame

This site which was excavated as part of the Traprain Law Environs Project (2000-2004) occupies an area approximately 2.5km south-east of the main Traprain Law site, the sites are probably thus geopolitically associated (Haselgrove, Carne & Fitts: 2009). Evidence for the first permanent occupation of the Whittingehame site occurs in the Late Bronze Age/Early Iron Age with the construction of an a-typical enclosed settlement, a period of abandonment is then archaeologically evident before significant Late Iron Age/Roman Period reoccupation occurs in what has been termed a 'scooped settlement' (Haselgrove, Carne & Fitts: 2009). Discussion for the Whittingehame site itself is isolated to an archaeobotanical evidential basis as initial palynological analysis of the site was not favourable. In total, 74 contexts were sampled for archaeobotanical residues at the Whittingehame site, following initial analysis 21 samples underwent complete processing, of which 4 were subsequently discounted from further analysis due to low seed frequency (Huntley: 2009). This is quite a size limited assemblage which is further restricted by the 'puffed and worn character' of particularly the cereal residues (Huntley: 2009). Such a condition report ultimately means that most detailed discussion must be restricted on account of the assemblage almost certainly demonstrating some bias (Huntley: 2009).

FUEL: - The evidential basis for the sites fuel profile whilst limited for the aforementioned reasoning, is sufficient enough to discount some of the more common materials which might otherwise have been suspected. Many of the processed flots contained indicative remnants of coal, clinker and partially burnt coal, this strongly suggests that coal and coal-composites existed in the sites fuel profile (Huntley: 2009). Within flots charcoal was also relatively prolific, a proportion of which is clearly smaller roundwood, this has been discussed as either kindling or a consequence of site cleanliness whereby such materials would be tidied and subsequently disposed of in hearths (Huntley: 2009). Ultimately this suggests a hearth profile dominated by coal and coal composite materials supplemented potentially by roundwood to intentionally aid in ignition or simply incidentally for disposal. In terms of locating a point of origin within the landscape to account for the coal resource at Whittingehame, the site is located relatively close to an eastern seam attributable to the modern Lothian Coalfield, the modern extent of this currently terminates approximately 14km west of Whittingehame in regard to shallow open-cast potential coal resources (Smith et al: 2008). This does not necessarily discount the existence of more localised resources peripheral to the main field extent, which may have existed closer to the Whittingehame site historically. What is more probable however, is the resources exploited originate from the Limestone Coal Formation which has evidence of working in the Haddington area from the 13th Century (Smith et al: 2008). In terms of the charcoal material recovered from the Whittingehame site, on the whole the taxa would most likely have been available in near proximity to the site itself. The preliminary Traprain Law pollen diagram indicates this likelihood, as certainly the dominant species *Betula* (Birch), *Corylus* (Hazel), *Alnus* (Alder) and *Calluna* (Heather) are prominent. The inclusion of *Sambucus* (Elder) within Context 55 is of particular interest as although it is also likely to have been a local shrub resource, its pollen is minimal to absent in the preliminary Traprain Law pollen diagram. Elder is quite characteristically a poor fuel resource, the cell structure of the material itself means it has a quick ignition and burn-time whilst its content of cyanogenic glycosides can result in noxious fumes which would in all probability contaminate any food resource cooked above the hearth (Mocanu & Amariei: 2022). On the whole the examined contexts may not be reflective of wood remains from hearth contents and could instead indicate the clearance of ground prior to construction (Huntley: 2009). This is considered most likely for Context 96 which is dominated by undefined 'root charcoal' and is ultimately the only context to contain *Calluna* (Heather) fragments. The aforementioned most commonly occurring taxa i.e. those with the most numerous fragments at the Whittingehame site, all tend to be classified as large shrubs to smaller trees, this distinctly indicates a surprising void in evidence for larger typically timber producing variants e.g. oak (Huntley: 2009). This potentially indicates situation of the site within/in near vicinity to open, secondary woodland although for many reasons this cannot be necessarily conclusive (Huntley: 2009).

CEREALS/FARMED PRODUCTS: – In terms of commonality *Hordeum* (Barley) is secondary and seems to be represented as clearly hulled or sufficiently abraded to defy classification as anything but 'undifferentiated' (Huntley: 2009). No naked Barley is recorded at the Whittingehame site. Other cereals are evident although less prevalent at the Whittingehame site, these include *Avena* (Oat) grains within around one fifth of samples, this makes Oats less abundant than Barley, whilst Wheat is present at less than 10% across all analysed material (Huntley: 2009). This is quite an unorthodox assemblage if generalised trends ascertained from other sites are applied, as the presence of Oats in a relatively high proportion is usually indicative of cereal profiles for later Scottish or Northern English sites (Dickson & Dickson: 2000). The absence of chaff from the assemblage, particularly 'oat chaff' presents an issue of identification, whereby the oats could be either domesticated or wild (*Avena fatua*) variants, however *Avena fatua* would also be a rarity at a prehistoric site (Huntley: 2009). Compounding the sites unusual assemblage Emmer Wheat (*Triticum dicoccon*) partially as grain, definitively as chaff is included in the assemblage, as this species is also associated normally with later sites. Whilst the single occurrence of a Bread Wheat node and *Chrysanthemum segetum* (Corn Marigold) compound dating confusion, as atypically Bread Wheat is an earlier Neolithic residue and *Chrysanthemum segetum* a later product. This leads to the summary conclusion that Whittingehame is not an atypical Late Prehistoric site, and its surrounding environs must be unusually fertile and diverse to support such a range of cereal crops if indeed resources are locally sourced and not imported. The Barley aspect of the assemblage is consistent with other Late Prehistoric sites and the Whittingehame site does employ it as its main subsistence species, typically Barley is a highly resilient species suitable for growth in a wide environmental scope including usually marginal environs (Lister et al: 2018). In terms of non-cereal secondary crop growth at Whittinghame there is little evidence, with the exception of two occurrences of *Pisum sativum* (Peas) although this is inconclusive for an actual crop.

WILD SUBSISTENCE PRODUCTS: – Unsurprisingly, as they are ubiquitous across Prehistoric sites, hazel nutshell fragments were common in the Whittingehame assemblage. Ultimately there seems little reason to doubt the importance of this resource as a diet supplement, or that this resource was sourced locally as *Corylus* (Hazel) also appears in the sites charcoal assemblage and the pollen diagram of Traprain Law (preliminary). The more intriguing wild resource at the Whittingehame site is *Fucus spp.* (Brown seaweed) thallus fragments, which had relative commonality being in a sixth of the samples (Huntley: 2009). Considerable effort was presumably dedicated to the attainment of this resource as its closest proximity source is the coast approx. 8km away. The most convincing use of this commodity is as an aspect of soil-enrichment or 'manure' potentially transported to storage at the Whittingehame site to rot or be burnt prior to application to arable contexts. Common practice historically was immediate ploughing of cartloads of seaweed into arable land upon collection, although some degree of composting with 'long litter' was also a possibility (Kerr: 1809). Within East Lothian this application was enacted at a rate of around 30 double cartloads per acre and was considered as effective as equivalents of animal refuse (Fenton: 1986). The *Fucus spp.* excavated from context 11 produced two radiocarbon dates (SUERC-10601; 10605) which suggest the *Fucus spp.* to be older than Barley and Hazel residue from within the same context (SUERC-10599; 10600) (Huntley: 2009). This puts the *Fucus spp.* residues at Whittingehame between the fourth and sixth centuries cal AD (Roman Period/Early Medieval) (Huntley: 2009).

2.2.3. Standingstone

This site was also excavated as a constituent of the Traprain Law Environs Project (2000-2004), situated approximately 2km south-west of the main Traprain Law site, again this would be indicative, due to mirrored chronology, of geo-politically associated communities (Haselgrove, Carne & Fitts: 2009). The first permanent occupation of the Standingstone site can tentatively be defined as an 'open settlement', with features radiocarbon dated to the Late Bronze Age, there then appears to be a period of abandonment clear within the archaeological record for some centuries. The earthworks at the Standingstone site then appear to have been reutilised in the Late Iron Age, for the situation of a more permanent 'open settlement' with potential ring-ditch housing structures (Hill: 1982). Following the Late Iron Age use of the Standingstone site seems to cease with no apparent explanation. In total for the Standingstone site 122 contexts were sampled for archaeobotanics, following the initial analysis 57 samples went on to undergo complete processing/analysis (Huntley: 2009). Whilst the assemblage size itself is more significant compared to Whittingehame the material itself is of similar condition (Huntley: 2009).

FUEL: - The indication is, that the once again, the primary fuel profile constituent for the Standingstone site is coal, with coal at various burning stages, clinker and coal-composites all prolific within the analysed flots. A suggestion is that, as with Whittingehame, the coal resource potentially being exploited at the Standingstone site, is a peripheral deposit associated with an eastern seam of the modern Lothian Coalfield, the main body of which is currently at closest proximity approximately 10km from Standingstone (Smith et al: 2008). It is also possible that the resource is sourced from the Limestone Coal Formation which has been worked around Haddington from the 13th Century (Smith et al: 2008). In any case it is probable that the source for both Whittingehame and Standingstone is the same, as the resource is not so prolific in the localised area that multiple sources are indicated, this would require and imply significant cooperation based on resource negotiation between sites. Once again, charcoal was moderately common within the Standingstone assemblage, interestingly however whilst smaller roundwood was present as it was at Whittingehame, much of the Standingstone charcoal assemblage consisted of larger *Quercus* (Oak) fragments (Huntley: 2009). Caution must be exercised however when commenting on the potential of the *Quercus* (Oak) fragments as fuel as none of them originate from a primary hearth context. The charcoal of the Standingstone site then could equally be resultant of coordinated 'tidying' of the close proximity site landscape. The relatively prolific presence of remnants of Sedges, Grasses and Bracken may indicate burning of turves, either intentionally as fuel or unintentionally in a roofing context (Hall: 2003). These 'turves' indicators may also be resultant of site tidying or as with other sites (Phantassie, East Bearford) could indicate specialised usage for cereal parching.

CEREALS/FARMED PRODUCTS: – General prevalence within the Standingstone archaeobotanical assemblage would seem to indicate that 6-row hulled barley and emmer wheat were the most extensively cultivated cereal crops (Huntley: 2009). Whilst oats are broadly identifiable within the assemblage, they are devoid of the diagnostic floret bases, so it is unknown if these remnants are of a cultivated or wild varietal. Overall, the contexts of these undetermined 'oats' being largely singular ecofacts and not identifiably stored product, indicates a greater probability of a wild varietal and incidental inclusion into contexts. Whilst evidence for spelt is extant it is of a minimal quantity and so could potentially represent a 'weed' species incidentally included in cereal processing remnants. The three contexts containing spelt have with subsequent associated radiocarbon dating, indicated a Late Iron Age association (SUERC-10547; 10558) (Huntley: 2009). Whilst no more in-depth conclusions can be made regarding crop processing procedures at the Standingstone site, it can be stated that the presence of both processed grain and chaff/processing remnants indicates that the major cereal species must have been to some degree processed locally, and it may also be assumed that product was cultivated locally (Huntley: 2009). The cereal/farmed product profile of Standingstone is diverse, although less so than perhaps Whittingehame or Phantassie, the potential for extents of non-fertile land around Standingstone could suggest that some product was imported from other sites and/or that arable production was not the main task of the Standingstone community, the presence of processing residues however maintains that significant arable production was undertaken by the community.

WILD SUBSISTENCE PRODUCTS: – The Standingstone archaeobotanical assemblage unsurprisingly supports the ubiquitous nature of Hazel nutshell fragments at prehistoric sites, it is judged however that whilst there is a widespread distribution pattern demonstrated, concentrations are not sufficient in singular contexts to indicate more than casual consumption (Huntley: 2009). It is thus unlikely that *Corylus avellana* (Hazel) or indeed *Malus* (Apple) constituted any more than a minor proportion of Standingstone diet profiles, moderate numbers of *Malus* (Apple) pips were evident in Fill (21) of Pit F56. The nature of these species as common and naturalised based on other site profiles has been taken to mean that they are locally sourced produce, from around the immediate vicinity of the site (Huntley: 2009). Pit F230 contained a Radish pod fragment, this could be wild-harvest evidence as the species by Prehistoric standards was edible, however nothing further can be made of the residue as it appears to be a singular instance. It is unlikely that this Radish pod fragment represents a secondary crop, although it could indicate 'garden subsistence agriculture', as there is no evidence within the archaeological record to suggest large scale cultivation of the species, there would also certainly be more identifiable examples at Standingstone. Only a singular example of *Fucus spp.* (Brown Seaweed) occurred at Standingstone in Fill 203 of Pit F212, this means it is significantly less evidential than at Whittingehame, ultimately use as a 'green manure' would be more believable in the Standingstone contexts if the species was evident archaeologically in greater amounts (Huntley: 2009).

2.2.4. Knowes

Another site ultimately investigated as a constituent of the Traprain Law Environs Project (2000-2004), the Knowes site is situated approximately 4km north-east of the main Traprain Law summit (Haselgrove, Carne & Fitts: 2009). The site is situated upon a broad terrace which slopes northwards towards the River Tyne, this environment marker and geomorphological resource is along with the Knowes site immediately visible from Traprain Law. There is no definite evidence of permanent occupation at the Knowes site until the Late Iron Age, this appears to initially have been unenclosed but increasingly and via various ditch structures the settlement was enclosed, potentially simultaneous to the enclosure process, in the first century BC, the Knowes site was also developing into a 'scooped settlement' (Haselgrove, Carne & Fitts: 2009). Abandonment of the Knowes settlement appears archaeologically to have been orderly and staged, this process also seems to have been highly ceremonial culminating with insertion of a stone cist into the southern ditch terminal, complete abandonment appears to have occurred by the end of the second century AD. In total the Knowes site provided 121 viable contexts from which 62 contexts definitely contained archaeobotanical material, of which 47 underwent complete processing/analysis (O'Brien: 2009). Again, due to less than optimum preservation conditions, detailed discussion may be restricted due to inherent assemblage bias (O'Brien: 2009).

FUEL: - The fuel profile identifiable at the Knowes site is complex as there are numerous differing fuel contexts, for example many of the cist burial contexts contain significant charcoal residues which seem most likely to be resultant from a funerary pyre (O'Brien: 2009). Various charcoal remnants from 26 contexts underwent examination, unfortunately only 15 fragments were identifiable to species level, these varied only in species between Alder and Oak (O'Brien: 2009). Alder is identified in the pollen report of Traprain Law and is thus most likely locally sourced, Oak is also evident. The oven structure so far as is identifiable is limited to Alder as a fuel resource, whilst Oak has predominance in cist contexts the implication being it was a preferred funerary resource (O'Brien: 2009). More fuel-orientated evidence exists for an earlier community present at the site during the mid to late fourth millennium BC, who excavated a total of 12 pits across 12m of level ground, some of which were packed with pottery sherds (Shearer & McLellan: 2008). Two of these pit structures (005, 026) were also packed with charcoal including many varietals, alder, birch, hazel, blackthorn, rose, cherry, willow and oak (Miller & Ramsay: 2008). This appears almost like a conscious bisect of all species present within the primary woodland potentially proliferating in the sites early chronology, this was radiocarbon dated variously to 3360-3090 BC (SUERC-7522) and 3520-3190 BC (SUERC-7523) for Pit Fill 004 and to 3370-3100 BC (SUERC-7524) and 3620-3360 BC (SUERC-7525) for Pit Fill 025. Ultimately this suggests that the fuel profile of the Knowes site became more homogenous across time, while still reliant on wood resources, it would seem that the diversity of species employed decreased. This could potentially indicate that the Knowes community had a significant environmental impact, if decreasing diversity is a result of resource exhaustion within primary woodland and no move towards secondary woodland regeneration.

CEREALS/FARMED PRODUCTS: – Arable cereal species at the Knowes site are dominated by the grain residue of Barley and Wheat, alongside chaff residues of 6-Row Barley, Emmer Wheat and Spelt, limited supplies of Oats are also evident (O'Brien: 2009). When radiocarbon dated these cereal residues confirm that settled occupation of the Knowes site is limited to the Late Iron Age and Roman period. Abundance of cereal residues was extremely localised to fills of the western enclosure ditch, drain (F140) and CS2 oven, whilst chaff was present within contexts much of the overall assemblage was dominated by clean (fully-processed) grain. Relatively low residual chaff could indicate that cereal processing occurred off the main Knowes site, or indeed that a proportion of arable product was imported to Knowes already processed.

WILD SUBSISTENCE PRODUCTS: – The Knowes weed taxa is extensive and informs to a great degree on the local environment of the Knowes site, for example Nettles are abundant in the assemblage indicating that there is a prevalence of disturbed ground surrounding the site's immediate vicinity. It is not beyond the bounds of belief that Nettles were intentionally cultivated as anthropologically the species has form as sustenance, medicinally, as a livestock feed supplement, cloth fibre and as a general household material. It is however more likely, despite significant presence within the Knowes assemblage, that Nettles were a wild harvested resource as they are hardy and likely grew abundantly within the surrounding landscape so would not have been prioritised for cultivation. Whilst the presence of Fat-Hen in the assemblage indicates potential for supplemented arable land, as the species is a prolific weed of such environments. Fat-Hen does have form as an intentional cultivated arable species but is usually reserved as a secondary crop or livestock supplement, in this case due to minimal assemblage presence and dominance of Barley as a primary crop, it is likely an arable weed. Some Hazel nutshell fragments were recovered at Knowes for example in area CS1, where a Wild Radish pod was also recovered, these Hazel nutshells were likely harvested as a supplementary food resource from local hazel woodland/stands. These woodlands could have been managed to optimise Hazel nut production via coppicing, however only minor prevalence in the Knowes assemblage indicates the species was a minor supplement to a main cereal diet. The Wild Radish pod could also constitute a wild harvested aspect of communal diet, an example was also recovered from the Standingstone assemblage, it could also however be an accidental inclusion with other heathland species. Onion Couch as already mentioned could also have been a supplementary food resource, recovered also from F378 underlying CS2, this is an oven context (CS2) which could indicate the cooking of Onion Couch tubers (O'Brien: 2009). The Onion Couch itself interestingly must have been harvested from a maintained environment of ungrazed grassland, in terms of maintenance such an environment would need to be manually cut to prevent succession to scrub/woodland (Rodwell: 1992). Livestock would not have been suitable for such maintenance as they would target more preferred species like Onion Couch for consumption, however the environment itself could have been maintained for the purposes of cutting hay for livestock. In contrast Ribwort Plantain would suggest that there was working pasture surrounding Knowes and thus that livestock was grazing locally (Behre: 1986). This could indicate that Knowes implemented a system of zones each employed for a different purpose and differing in environment and thus plant species profile.

2.2.5. East Bearford

The East Bearford site was evaluated as a constituent of the Traprain Law Environs Project (2000-2004) (Haselgrove & Hale: 2009). The East Bearford site is situated approximately 2.5km west-south-west of the main Traprain Law summit site. The site has relevance according to its presence within the same landscape as Traprain Law, with a similar chronology to all aforementioned sites, thus suggesting some degree of geo-political relation. The majority of the East Bearford site seems to date to the Late Iron Age, corresponding with other sites, the site also shares a number of features with the previously discussed Knowes site including its rectilinear enclosure (Haselgrove & Hale: 2009). In totality for the East Bearford site bulk samples were taken from five contexts, of which four were discounted as non-viable for plant macrofossils, the remaining sample was waterlogged, Basal Fill (23), and thus was analysed in its entirety (Huntley: 2009).

FUEL: - Basal Fill (23) constituted almost completely of fine amorphous organic materials, with inclusions of identifiable *Calluna* (Ling Heather) wood, shoots and flowers, also non-identifiable wood fragments (potentially shrub constituents), Bracken frond fragments and occasionally substantial grass stems (Huntley: 2009). Whilst the fine amorphous materials potentially indicate species growing within the immediate vicinity of the ditch context from which the sample was recovered, *Calluna* (Ling Heather) and Bracken are species more associated with heathland/moorland (Huntley: 2009). The aforementioned species are often the main constituents of turf or 'turves', this material was multi-purpose used primarily for fuel but also in some instances as a building material. Whilst at first it seems unlikely that used as a fuel, the material would simply be discarded in a ditch, the presence of *Calluna* (Ling Heather) flowers specifically demonstrates material discard at time of flowering, at such a period this species and indeed other heathland/moorland species have a greater water-content and when unseasoned are less easily burnt. Thus, discard of less efficient fuel material is logical, whether this was temporary in order to dry/season the 'turves' or permanent discard is unclear. So, it seems that the East Bearford site certainly employed turf in a fuel capacity, alongside potentially minimal wood. As a singular Alder twig was identified within Basal Fill (23) which was also radiocarbon dated (SUERC-10626) establishing a date consistent with the Late Iron Age. It is possible that this Alder was an incidental inclusion within 'turves' as both grow within the same environmental context, and 'turves' are a conglomerate material.

WILD SUBSISTENCE PRODUCTS: – Presence of supplemented fields is tentatively indicated by species which are most successful in nitrogen-enriched sediments including various species of *Urtica*. This account of weed taxa suggests East Bearford was a site dominated by arable fields and marginal boundary environments, these are not normally conducive to harvest of a variety of wild/subsistence products, suggesting access to these was limited. Although some weed taxa such as *Urtica* are edible, these are not normally considered choice dietary constituents.

2.2.6. Pencraig Hill

The site of Pencraig Hill was excavated as part of 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project undertaken by the GUARD archaeological unit, in response to upgrading of the A1 motorway. The site itself is situated on an area of relatively level terraced arable ground, on the southwestern slope of Pencraig Hill approximately 85m AOD, after this feature the slope intensifies giving way to the consistently cultivated regions of the River Tyne (Lelong & MacGregor: 2008). This site is located approximately 2km north of the main site of Traprain Law, which makes this site particularly pertinent to discussion regarding potential inter-site interactions, especially considering the potential ceremonial use of the Pencraig Hill site. The earliest phase of occupation identified at the Pencraig Hill site dates to the early fourth millennium BC, with construction of ceremonial structures in an area where topography obscured views northward but allowed an open view to Traprain Law in the south (MacGregor & McLellan: 2008). The status of the Pencraig Hill site as broadly Neolithic in date means it precedes any significant occupation at the main Traprain Law site, however some evidence exists to suggest that the Traprain Law site was developing increased importance within the landscape at the time of the Pencraig Hill in-situ burning.

FUEL: - The earliest phase of the site suggests an organised programme of clearance perhaps highly ritualised, an aspect of this appears to have been the lighting of a number of small fires, in situ burning events whereby fire remnants were spread outwards with the subsequent ignitions occurring in the ashes of the previous (MacGregor & McLellan: 2008). The major contributors to this events fuel profile appear to be primarily oak, followed by smaller quantities of alder. Oak appears to dominate at this site as the sub-trapezoidal feature constructed following clearance seems to have been constructed at least partially of oak timbers. The site developed further, perhaps as an intercommunity project, with further features potentially ceremonial in nature, including a number of trenches, with screen-type features built of oak planking secured by pine, alder or hazel pegs (Miller & Ramsey: 2008). Perhaps presence of oak in such fuel contexts is a direct result of prioritization for construction, whereby residues and off-cuts are burnt instead of being wasted or employed in some other capacity. A tradition of using oak in construction at this site, continues to the later structures of this site, namely an oak timber mortuary structure 4.4m long by 1.4m wide, this structure appears to have been intentionally burnt in situ (MacGregor & McLellan: 2008). The prevalence of oak within the Neolithic context of this site, suggests that the wider Traprain Law landscape at this time was dominated by primary woodland, as yet undisturbed by intensive clearance practices. Interestingly, such an environment would also have been dominated by birch, yet this species is absent archaeologically from Pencraig Hill, this is especially interesting when it is considered that birch as a material reliably burns and is a strong construction material (MacGregor & McLellan: 2008). Use of birch as a material, thus appears to have been actively avoided for the purposes of fuel or construction, if used at Pencraig Hill therefore the species cannot have come into contact with fire consistently. Beyond this species like oak and alder are hardwoods and so within a hearth context would exhibit longer burn-times than for example birch, it may have been a practical consideration with lesser amounts of the hardwood species required and therefore less collection associated time and effort designated. This would be considered an easily instigated economy of effort, whereby saved time and physical engagement could be rerouted to other practices necessary for survival.

CEREALS/FARMED PRODUCTS: – The fill of the northern screened-ditch feature contained a few grains of six-row barley (*Hordeum vulgare*), potentially a discarded hearth waste residue (Miller & Ramsey: 2008). The presence of six-row barley at this site is unsurprising as it is a major constituent component of many such assemblages in the region, in this case the residue could be associated with those involved in the construction of this ceremonial site.

2.2.7. Pencraig Wood

The Pencraig Wood excavation was a constituent of 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project which was in direct response to the upgrading of the A1 motorway, the project itself was undertaken by the GUARD archaeological unit. The site itself is on arable ground, on top of a ridge which forms the western flank of a wooded area also known as Pencraig Wood, around 90m AOD (Lelong & MacGregor: 2008). At approximately 2km north-west of the main Traprain Law site and with some degree of direct visibility between sites, inter-site interaction and relation is logical. The excavation uncovered a number of pit features, aspects of the fills of which date site activity to throughout the third and second millennium BC (McLellan: 2002). The quality of activity at this site does not seem to suggest permanent occupation, but rather continuous, potentially ceremonial, temporaneous involvement. Thus, involvement with the Pencraig Hill site is probable. This site too appears to predate significant activity at Traprain Law, however the dominance geomorphologically of Traprain Law within the East Lothian coastal plain would make it an attractive addition in some aspect to the ceremonial activities apparently undertaken at both Pencraig Hill and Pencraig Wood. In fact, a number of Neolithic associated artefacts were recovered from the Traprain Law summit site, there are also earlier (undated – Neolithic to Bronze Age) cup-and-ring, linear and lozenge/chevron rock carvings at various points across the summit some incorporated into later Iron Age structures. Activity was occurring simultaneously at Pencraig Wood, Pencraig Hill and Traprain Law, although this was not occupation orientated.

FUEL: - Around the mid-third millennium BC a Pit (027) was excavated at this site with two distinct Fills (025 – Lower, 022 – Upper), the lower fill consisted of fragments of burnt hazelnut shell and oak charcoal residue, whilst the upper fill consisted of oak charcoal and some pottery sherds. The hazelnut shell of the lower Fill (025) produced radiocarbon dates of 2480-2230 BC (SUERC-6890) and 2460-2200 BC (SUERC-6891) (MacGregor and Stuart: 2008). Oak across sites was potentially largely reserved for structural purposes. Pit 024 was filled with a Deposit (023) of burnt hazelnut shell and diverse charcoal residues including alder, birch, hazel, apple-type, oak, rose-type and willow (Miller & Ramsay: 2008). This would seem to represent a diverse fuel profile of primary woodland species at the Pencraig Wood site during the mid-third millennium BC. During the cremation period at this site, 1500-1260 BC, hazel and oak charcoal dominate, potentially alongside some alder and blackthorn. The fuel profile for the Pencraig Wood site is thus consistent throughout site activity with resources collected from primary woodland, and with the exception of maybe oak, incidental collection.

WILD SUBSISTENCE PRODUCTS: – During the early second millennium BC, two Pit features were excavated at this site, Pit 012 was partially filled with human cremation deposits which included carbonised hazelnut shell fragments, hawthorn seeds and cleaver seed (MacGregor: 2008). Whilst it seems likely that the hazelnut shell residues indicate a purposeful offering from the funerary pyre and the hawthorn seeds could also be accounted for in this way, the cleaver seeds as well as potentially the hawthorn seeds could indicate incidental inclusion as a tinder/fuel product for the pyre.

2.2.8. Overhailes

The site of Overhailes constitutes a small geomorphological shelf on the south-facing slope down from the summit of Pencraig Hill, this site was thus also excavated as a constituent of 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project undertaken by the GUARD archaeological unit, in response to upgrading of the A1 motorway. The site is approximately 70m AOD and has visibility southwards towards the main site of Traprain Law (Lelong & MacGregor: 2008). Overhailes is approximately 1.5km north of the main Traprain Law site, which certainly opens up possibilities regarding significant inter-site interactions potentially even site connection beyond trade. There are several different defined periods of activity at this site, the earliest activity dated to 7600-7525 BC in connection with an ambiguous feature, next between 3340 BC and 2900 BC a number of pit features were excavated, then finally between 2340 BC and 1740 BC a building was constructed and an associated 'stone-box' feature (MacGregor & Stuart: 2008). This means that the site was in use prior to the occupation of the main Traprain Law summit site, however as already indicated there was certainly earlier (Neolithic) ephemeral, potentially ceremonial, activity at the Traprain Law site prior to occupation.

FUEL: - The 3340 BC to 2900 BC period of activity at the Overhailes site saw the building of a number of temporary structures which were eventually burnt to the ground. Whilst this is not immediately of use in regards to a fuel profile, a number of charcoal residues were recovered from post holes which could suggest at the resources available in this earlier period for fuel purposes. The main structure appears to have made use of oak for construction purposes, whilst the 'yard' structure is significantly more diverse in terms of species employed, perhaps due to the presence of woven hurdling (Miller & Ramsay: 2008). Whilst oak dominates marginally in terms of construction materials, Post-Hole 250 contained hazel, blackthorn and oak, whilst Post-Hole 172 contained alder, birch and heather, another Post-Hole 154 contained only hazel, whilst yet another Post-Hole 178 simply contained heather (MacGregor & Stuart: 2008). This suggests a diverse range of materials were available within local environments for fuel purposes, in particular it could also indicate a change within the local environment as the presence of heather indicates development of atypical peatland perhaps due to clearance based on overexploitation of primary woodland species. For example, no heather was evident within the assemblage of the earlier site of Pencraig Hill, in fact the materials employed there were significantly more homogenous indicating a greater degree of selectivity. There could potentially be a diversification of material use at Overhailes out of necessity. In terms of direct evidence for a fuel profile in this period, Pit 247 contains a number of deliberate layers of burnt plant remains, specifically in Context 246 residues of hazel, oak and willow, fragments radiocarbon dated to 3340-2920 BC (SUERC-7504) and 3320-2910 BC (SUERC-7505) (MacGregor & Stuart: 2008). A second feature Pit 050 Fill 017 also contained layering of burnt plant remains, including residue of hazel, apple, blackthorn and oak charcoals (Miller & Ramsay: 2008). The radiocarbon dates in this case were 3340-3010 BC (SUERC-7509) and 3270-2900 BC (SUERC-7510), very similar to those of Pit 247 (MacGregor & Stuart: 2008).

CEREALS/FARMED PRODUCTS: – The oat recovered from Pit 241 Fill 240 with an associated radiocarbon date of 1150-1280 AD (SUERC-7514) would seem to indicate that whilst Overhailes was not permanently occupied during the Medieval period, it either had transient occupants or was employed by agricultural individuals as temporary shelter, in either instance the presence of oat in this period is unsurprising as the species begins to dominate across Scotland from the medieval period onwards (Dickson & Dickson: 2000). Prior to this Post-Holes 016, 051, 288, 321 and 326 appear to have been back-filled with burnt plant remains, residues including in Context 287 various indeterminate cereal, whilst in Contexts 015 and 325 cereals, radish, pea, hazelnut shell and tuber fragments were evident (Miller & Ramsay: 2008). This suggests a relatively diverse range of farmed products, although some residues such as the 'tuber fragments' could easily have been wild subsistence harvests, whilst the hazelnut shell is obviously so. The diversity of cultivated products in this case could represent 'garden-style' cultivation, potentially via slash-and-burn agriculture whereby temporary clearances are curated through deliberate clearance, the natural downed biomass then left to dry before being burnt thus introducing nutrient rich ash into sediments. This is a shifting form of cultivation which many transient communities employ either in woodland environments or to clear waste ground and optimise it for agricultural production, the Neolithic communities of Europe are known to have engaged with this technique (Clark: 1952).

WILD SUBSISTENCE PRODUCTS: – From the period 3340 BC to 2900 BC one smaller Pit (009), appears to have been filled partially with food remains, an identified aspect of which was hazelnut shell (MacGregor & Stuart: 2008). This is unsurprising as hazelnut shell as a wild subsistence resource occurs throughout the Overhailes site, and more broadly is ubiquitous in Neolithic sites throughout Scotland. As already stated, Pit 007 contained amongst other charcoal residues, blackthorn, this is somewhat intriguing as blackthorn is the species which produces the extremely edible sloe-berry. This would firstly suggest that the Pit 007 wood was an incidental collection, natural fall or tree decline as logically such a resource would probably be preserved, secondly it proves that sloe-berry resources were around to subsidize cereal dominant diets. A similar argument may be suggested for every incident of oak charcoal recorded, as it necessitates the presence of acorn reserves, it again proves presence, and it is likely such resources supplemented diets, but it does not prove this is the case. It is likely that significant wild harvesting practices can be associated with the Overhailes site, as the community represents a transitional period between transient hunter-gatherer systems to more settled agricultural communities.

2.2.9. Phantassie

The site of Phantassie consists of an extensive farmstead with primarily stone-built structures, dating to the late first millennium BC and early first millennium AD (Lelong & MacGregor: 2008). It is situated at the break of slope above a river valley, this appears to have been a favored geomorphology for later prehistoric settlement. The site was excavated as a constituent of 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project undertaken by the GUARD archaeological unit, in response to upgrading of the A1 motorway. The site is approximately 2.7km north-east of the main Traprain Law site, which certainly indicates some degree of site relationship, particularly perhaps trade in agricultural product as Phantassie represents a sizable farmstead site set in well-established arable fields. A number of higher status items recovered from this site such as a Samian Ware bowl fragment, blue glass bangle, or recycled metals of Roman origin, seem to support a trading connection with the Traprain Law site perhaps for agricultural surplus.

FUEL: - Phase 1 occupation of this site included excavation of Ditch 384, which was then set with stones at its base potentially to support a palisade, this was then back-filled with midden materials more than two millennia later (303) which contained burnt heather and cereal grains, potentially indicating processing waste. Similarly, the southern aspect of Area A, where Deposit 388 is full of birch, hazel and heather charcoal and cereal grains. This would suggest that the early fuel profile of the site was dominated by wood and 'turves', sourced from a secondary woodland landscape peripheral to open wasteland/heathland. During Phase 2 (2nd to 1st Century BC) at the site where the Eastern Wall (311) was constructed, the gap between its faces was packed with midden material including hearth rake-out, where heather, birch, hazel and barley had been burnt (LeLong: 2008). Later this Eastern Wall was thickened with midden material (126) packed up against the wall face, this was rich in carbonised cereals, and oak, birch, heather and hazel charcoals. The hazel in this case is largely 12-year-old roundwood, this may have once constituted a wattle panel, the uniformity in the hazel staves potentially indicates local coppicing of hazel woodland for the purpose of construction (Lelong: 2008). One fragment of this hazel provided a radiocarbon date of 110-80 AD (SUERC-5490). The wood/'turves' fuel profile of the site remains relatively consistent, with the exception of oak residues which could have been reserved for the construction of structures due to the material qualities. It is clear that this potentially fuel-deficient landscape was managed to optimize potentially minimal resources through coppicing, birch and hazel are prime candidates for this management strategy. During Phase 3 at the site there are instances of cherry-type charcoal, for example sealed beneath Wall 056 of Structure 9 which provided a radiocarbon date of 20 BC-AD 210 (SUERC-5639). This phase also saw the neglect and abandonment of Building 1, the area of which essentially became covered by midden deposits, which included seeds associated with heathland turf conglomerates and charcoal from alder, birch, hazel, willow, oak and blackthorn-type (LeLong: 2008). This is a clear diversification within the fuel profile, more consistent with developing secondary woodland potentially established as a result of careful environmental management systems including coppicing imposed by the Phantassie community. A change in fuel profile occurs again during Phase 4, the fire-pit (331) in Structure 9 demonstrates this as before mainly heather was burned with smaller quantities of hazel and oak in domestic hearths, the Phase 4 community still burned a significant quantity of heather but also larger quantities of hazel, willow, blackthorn-type and cherry (LeLong: 2008). It seems that the burning of heather moorland turves overtook the stone heating method previously used for cereal parching, as is suggested by increasing carbonised heather stems and moorland specific seeds. The heather 'turves' resource previously used in all fuel contexts in Phase 4 is prioritized for cereal processing purposes.

CEREALS/FARMED PRODUCTS: – The cereal grains of Deposit 388 include wheat, naked barley and six-row barley, one such grain of barley produced a radiocarbon date of 350 BC-AD 10 (SUERC-5620). This suggests a certain degree of arable agricultural involvement by the community, even a potentially diverse system whereby multiple crops are grown simultaneously within the same context. All of the aforementioned crops are consistent with wider arable agricultural growth trends in the Iron Age/Roman Period, where there is a clear reliance on Barley but with intensification of Wheat growth. Structure 2 to the west of the cobbled path and south-west of Building 1, is an area potentially used specifically for the parching of grain, as a spread of pink-orange silty clay (110) surrounds the structure, and this is rich in heather charcoal and heavily carbonised cereal grains, including six-row barley (LeLong: 2008). The post-holes which constitute Structure 2 could have supported a frame which suspended cereal over the fire allowing it to dry slowly and in a more controlled manor. A grain of barley from the pink-orange silty clay (110) deposit provided a radiocarbon date of 110 BC-AD 80 (SUERC-5202). During Phase 3 of the site Concentric House 9 was constructed this had a fire-pit (331) which appears to have had a specialised use for cereal parching, as it was packed with heat effected stones (188) and a matrix (197) full of heather charcoal and burnt cereal grains. In this case the stones would have provided a safer more diffuse heat than a fire, the heather charcoal could indicate either specific use as fuel or the surviving aspect of a conglomerate turf, both instances are known to have been employed in cereal parching process. Phase 4 saw the construction of a number of buildings over the midden deposit which covered Structure 1, the newly constructed Southern Cell (13) appears to have been another region specifically intended for cereal parching, as the floor deposit contained heather charcoal and grains of emmer wheat, six-row barley and other indeterminate cereal grains. Birch charcoal recovered from Post-Hole Fill 367, which could have constituted a drying frame, provided a radiocarbon date of 50 BC-AD 120 (SUERC-7345). This preoccupation with cereal processing for long-term storage is not so clear at any other Traprain Law environs site, which could indicate that this was a specialised purpose of the site and that cereal resources throughout the area filtered through Phantassie for processing. Micromorphological analysis of the midden store deposits indicates that the material was being purposefully composted, with residues from manure impregnated turf, which may have been employed as livestock bedding and deposited at the midden store when byres were cleaned. This seems to indicate a sophisticated fertiliser system, where the midden store was periodically cleaned out for use on arable fields (context comparable to Howmuir) or more generally within agriculture, with some of the deposit remaining behind each time to act as a catalyst for further composting.

WILD SUBSISTENCE PRODUCTS: – During Phase 3 there is evidence of some wild harvest in regard to hazelnuts, for example in Fill 057 of Structure 9, where a hazelnut shell fragment provided a radiocarbon date of 50 BC-AD 120 (SUERC-5488). During Phase 4, hazelnut shell becomes a more common constituent of midden deposits and hearth rake-out. This is somewhat unusual as hazelnut resources are normally associated with early Prehistoric contexts, intensification in the Roman Period and later is uncommon. Presence of oak, blackthorn and cherry-type charcoal also confirm the existence of associated resources of acorns, sloe-berries and cherry-type fruits all of which are common wild subsistence resources and thus could have been harvested to supplement diet.

2.2.10. Howmuir

The Howmuir site consists of a number of linear prehistoric features, the site itself is situated on level ground south of the modern railway line and at approximately 30m AOD (Lelong & MacGregor: 2008) The site was excavated as a constituent of 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project undertaken by the GUARD archaeological unit, in response to upgrading of the A1 motorway. Howmuir is approximately 4.8km north-east of the main Traprain Law site, which does indicate potential in regard to interactions between the sites. The major phase of activity at this site dates to the mid to late second millennium BC (McLellan: 2008). This is not a main occupation site, instead it appears to be a significant midden context strategically positioned on arable field boundaries, potentially for redistribution as soil supplementation.

FUEL: - A significant feature of the Howmuir site is a linear Ditch 004/005, which seems to have remained undisturbed for some time upon completion, eventually silted with natural in-wash/deterioration, including with charcoal residues predominantly oak but also hazel, birch and cherry type, either from nearby occupation or from midden practices in the agricultural fields (Miller & Ramsay: 2008). This is certainly depositions from multiple hearth events as a sample of the cherry type charcoal from Silt 009 Slot 2 gave a radiocarbon date of 1680-1490 BC (SUERC-7534) whilst hazel charcoal from the same context radiocarbon dated to 1610-1410 BC (SUERC-7533). Later hearth residues seem to have been actively deposited in the northern aspect of the Ditch feature, with residues including oak, hazel and willow, a fragment of willow charcoal radiocarbon dated to 1690-1510 BC (SUERC-7531) whilst a hazel fragment from the same context radiocarbon dated to 1680-1490 BC (SUERC-7529). Interestingly the wood fuel profile across time is relatively consistent suggesting that woodland resources in the area may have been managed for longevity of usage, hazel and willow are prime species for coppicing for example.

CEREALS/FARMED PRODUCTS: – Micromorphological analysis of various ditch fills suggests that this site was largely arable fields, as crops were being grown close by at an intensity high enough to destabilise sediments and cause the silting up of the various ditch features (McLellan: 2008). Therefore, it is clear that this site was agriculturally intense, however it is not clear what farmed products were cultivated.

WILD SUBSISTENCE PRODUCTS: – Oak, hazel, cherry-type charcoal residues confirm the presence of acorn, hazelnut and cherry-type fruits, all of which have wild harvesting potential to supplement diet.

2.3. ZONE 2

(*Figure 2.5*)

2.3.1. Introduction - Zone 2

This Zone includes sites which are on the periphery of the East Lothian coastal plain, situated either directly on the coastline or elsewhere within the modern county of East Lothian. These sites may have had direct involvement with the main site of Traprain Law as satellite sites, as they exist in some cases still within the same landscape, however other sites such as that of Broxmouth represent useful comparisons due to site nature as a power-centre or higher status settlement. Many of the sites included have easy access to coastal environments and resources, consequently geomorphologically and visually they are disparate from the main environment typologies of the East Lothian coastal plain i.e. arable fields, grassland, wasteland. A number of the Zone 2 sites are included in 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project which also includes Zone 1 sites, this is not an issue as the modern A1 route transects environments. Incidentally it has worked out that any sites >5km up to 20km distant from the main Traprain Law summit are categorized as Zone 2 (Figure 2.5).

2.3.2. Fishers Road West

The Fishers Road West site is located to the immediate south of the modern settlement of Port Seton, East Lothian at an altitude between 10-15m AOD (McCullagh & Mills: 2000). Phase 1 and Phase 2 of the Fishers Road West site could not ascertain reliable radiocarbon dates however Phase 3 and Phase 4 both of which include in the time frame significant enclosure building activity are both respectively dated, Phase 3 to the 2nd century cal BC and Phase 4 the 1st century cal BC to the 1st century cal AD (McCullagh & Mills: 2000). Whilst no date can be given for the sites earliest occupation it can be stated that it was a significant period prior to Phase 3 as there appears to be an occupation hiatus before the site was reoccupied in the Middle Iron Age (Phase 3), there may have been a short cessation in occupation between Phase 3 and Phase 4 (Later Iron Age) which seems to be the sites main occupation period. The archaeobotanical, specifically cereal, assemblage for the Fishers Road West complex was largely demonstrative of poor preservation, often lacking pericarp thus precluding specific identification. Despite this a proportion was identifiable to species level, especially a large cache recovered from Pit 1019.

FUEL: - Only a little evidence within the Fishers Road West macrofossil assemblage seems to indicate potential fuel constituents, carbonised indicators of 'heathy-turf' were recovered from residues taken from the site ditch complex. These include *Calluna vulgaris* (Heather – capsules, leaves), *Ericaceae* (Heather *sp.* – stems), *Carex* (Sedge – rhizomes, nutlets), *Scirpus* (Club Rush), *Isolepis setacea* (Bristle Club Rush) and *Poaceae* (Small Grasses – caryopses) (Miller, Ramsay & Alldritt: 2000). Due to these 'heathy-turf' indicators recovery in association with significant carbonised cereal residues within ditch deposition contexts, it has been postulated that this constitutes fire waste products from a crop processing stage (Miller, Ramsay & Alldritt: 2000). The site is thus comparable to Whittingehame, Standingstone, Phantassie and East Bearford, in regard to indicators of cereal parching via use of 'turves'. Anthropologically 'cut turves' have been employed as a means of creating a controllable slow-burn for the purpose of parching cereal prior to long-term storage (Fenton: 1978). Minimal charcoal residues suggest a lesser role in the Fishers Road West fuel profile and postulates a low local availability of wood (Miller, Ramsay & Alldritt: 2000). However, local pollen records suggest the site occupied a landscape of major woodland presence, this of course does not correlate in terms of fuel profile with the minimal charcoal recovery. The potential woodland-based fuel resources seem to have had purpose/value for the Fishers Road West community in another aspect, for example as a curated landscape shelterbelt to increase agricultural proclivity or as reserved construction materials.

CEREALS/FARMED PRODUCTS: – The most prolific cereal species at the Fishers Road West site was *Hordeum vulgare s.l.* (Barley) with the predomination of the hulled varietal (Miller, Ramsay & Alldritt: 2000). This is a confirmation of current knowledge regarding broad trends in cereal cultivation within Britain post-Bronze Age (Van der Veen: 1992) (Greig: 1991). Despite difficulties in crop identification a small proportion of cultivated Oats was identified, this species could be present within the assemblage simply as a 'weedy contaminant' via growth on marginal habitats or indeed as a calculated intentional inclusion due to mixed cropping strategy (Miller, Ramsay & Alldritt: 2000). The residues recovered from Pit 1019 are almost completely 'pure' *Hordeum vulgare s.l.* (Barley), the cache is dated to approximately 1st century cal AD (AA-26224) and thus contemporary to many Phase 4 features (Miller, Ramsay & Alldritt: 2000). The differentiation in crop assemblage profile between Pit 1019 and the Phase 4 ditch clearly demarks those residues which underwent processing for the purpose of storage and the disposal of waste products. The minor inclusions of Naked Barley are liable to represent relict crops and accidental harvest as opposed to a system of mixed cultivation (Miller, Ramsay & Alldritt: 2000). Within the chronology of the Fishers Road West site the utilisation of Emmer Wheat and Spelt Wheat appears to have become possible locally, this indicates the presence of potentially drier, better drained sediments along the east coast, or otherwise the importation of this resource from further south (Miller, Ramsay & Alldritt: 2000). This thus credits the Fishers Road West community with either a significant understanding of the surrounding landscape, specifically cultivating a crop on a fairly minimal amount of appropriate land, or indeed a reliable trading network which extended relatively far south. Previously, indications have been that Emmer Wheat and Spelt Wheat were on the whole traded products for Scottish sites, as was the example of the Early Iron Age Oakbank Crannog, Loch Tay, Perthshire where both glume wheats were present, but the conclusion was that they would be unlikely to crop satisfactorily so far north (Miller et al: 1998). This reality of either highly localised cultivation or importation from contacts further south, may also account for the proportion of Bread Wheat recovered from the Fishers Road West site.

WILD SUBSISTENCE PRODUCTS: – There are a number of potential 'wild subsistence' species present within the Fishers Road West macrofossil assemblage, including residues consistent with *Rubus idaeus* (Raspberry) and *Rubus fructicosus* (Bramble) (Miller, Ramsay & Alldritt: 2000). Both species are potentially supplementary to a community diet and wild subsistence resources but could also simply have been incidental incorporations into the assemblage due to growth within the context vicinity. However, logically at least some casual consumption seems likely in a society with variant levels of food security and whom otherwise would have only minimal natural sugars (fructose) within their diet. Whilst the 'tastes' of prehistoric communities were certainly different to 'modern tastes', the harvest and consumption of fruiting varietals is attested archaeologically (Dickson & Dickson: 2000). In a modern/anthropological context wild harvesting of fruiting varietals, in particular 'berries' is still the most commonplace form of wild consumption (Dickson & Dickson: 2000). Similarly, two distinct (seed) residues of *Sambucus nigra/racemosa* were recovered, in all likelihood *Sambucus nigra* as opposed to *Sambucus racemose* which is an introduced species (Miller, Ramsay & Alldritt: 2000). This can be taken so far as to suggest that Elder (*Sambucus nigra*) was growing to some degree within close vicinity to the Fishers Road West site and was consequently available as a wild subsistence product. However, the species *Sambucus nigra* is less appealing in regard to fructose content which is minimal. The species also has the added caveat of containing cyanogenic glycosides, as a consequence of which unripe berries, seeds and all residual 'green' parts of the species are poisonous and the berries themselves require processing (i.e. cooking) from a raw state in order to be edible (Vedel & Lange: 1971). The species is also present within the Whittingehame assemblage, in this case however as charcoal residues so there is less definitive evidence of consumption. A single *Prunus sp.* fruitstone, in a state of poor preservation, was also recovered from the Fishers Road West site (Miller, Ramsay & Alldritt: 2000). No further identification of this single *Prunus sp.* occurrence could be undertaken due to poor preservation however presuming the incident was not resultant of infiltration, the *Prunus* genus includes a number of wild subsistence species including *Prunus avium* (Wild Cherry), *Prunus spinosa* (Blackthorn/Sloe), *Prunus padus* (Bird Cherry). Limited residues attributable to *Vaccinium myrtillus*/*Vitis-idaea* (Bilberry/Cowberry) were recovered from the Fishers Road West site (Miller, Ramsay & Alldritt: 2000). Thus, either/both species represent an available wild subsistence resource with potential for harvest, however as both species proliferate in heathland/peatland environments their introduction into the Fishers Road West assemblage could have been as constituents of heathy-turf for fuel/construction purposes. The species *Hyoscyamus niger* (Henbane) was also present and is considered multi-purpose displaying both medicinal and minor nutritive qualities. As with all contexts, presence does not prove active usage, however the species has specific medicinal uses and within later contexts has been recovered with variant species with similar purposes. For example, in association with *Atropa belladonna* (Deadly Nightshade) and *Papaver somniferum* (Opium Poppy) at the Soutra Hill site, a medieval hospital complex (Moffat: 1992). *Hyoscyamus niger* does display relative diversity as a medicinal material, having narcotic (active constituent, hyoscyamine), analgesic (active constituent, atropine) and sedative (active constituent, hyoscine) usage potential (Stuart: 1989) (Miller, Ramsay & Alldritt: 2000). There is some evidence to suggest that apart from being traditionally medicinal *Hyoscyamus niger* (Henbane) has properties sympathetic with spiritual usage. Recently, these spiritual properties seem to have confirmation via the recorded experience of M. Schenck, indicating altered vision (haziness, colour alteration, etc.) and altered perception/emotional state (giddiness, decreased motor skills, etc.) (Kuklin: 1999). All that may be stated in any case is that the community of Fishers Road West had access to *Hyoscyamus niger* (Henbane), to what use it was applied or whether it was used at all can only remain theoretical.

2.3.3. Fishers Road East

The Fishers Road East site is also located to the immediate south of the modern community of Port Seton, East Lothian at an altitude around 10m AOD (Haselgrove & Lowther: 2000). Whilst no clear foundation date was identifiable for the Fishers Road East site, the sites main period of activity has been roughly ascertained as between the 1st century cal BC and the 2nd century cal AD (Haselgrove & Lowther: 2000). During the period between the 1st century cal BC and 1st century cal AD, many of the sites main features appear to have been in use such as Enclosure 1, Enclosure 3 and potentially three of the more well-preserved housing structures. As is quite common for such sites the first features to become obsolete from their original use were the internal ditches which appear to have been repurposed as areas for the disposal of domestic waste and crop processing residues. This trend is potentially observable with the main Traprain Law site which reportedly has potential midden deposits accumulating in internal ditch features contemporary with the sites later chronology. The identified site occupation/usage period is tentatively proposed, as traces of activity were identified prior to the 1st century cal BC potentially to the first half of the millennium, and whilst a termination point of the 2nd century cal AD is compelling it does not discount usage of the enclosure complex for non-residential purposes afterwards (Haselgrove & Lowther: 2000). The archaeobotanical assemblage for the Fishers Road East complex was reasonably well-preserved with some observable surface features, a small proportion of contexts also demonstrated material preserved in anaerobic, waterlogged conditions.

FUEL: - Considering environments indicated via plant residues assigned their most a-typical present-day ecological category for the Fishers Road East site, after arable cereal ground and wet ground taxa, heathland is the next abundant habitat typology (Huntley: 2009). Heather (*Calluna vulgaris*) has a high frequency throughout the Fishers Road East contexts, with various constituents represented including flowers, wood etc. (Huntley: 2009). The woodier aspect of this assemblage, it has been considered, could represent an import conglomerate with dry heathland peat, for use as a fuel constituent. This would suggest that the immediate vicinity of the Fishers Road East site did not have a long-term reliable fuel resource, the closest potential point of import for peat conglomerates in this case is approximately <10km distance and could represent another interaction between this site and the immediate Traprain Law environs. The other constituents of the Heather (*Calluna vulgaris*) residues are less likely to have arrived at the Fishers Road East site via this vector, unless associated turf conglomerates were transported alongside the 'heathy peat', this seems unnecessary however as comparable resources are attainable from immediate surrounding landscapes. Instead, the non-peat preserved heather was more likely used as a construction/roofing material, bedding, etc. The 'tree/scrub' species identified at the Fishers Road East site are present in such minimal frequency that it is suggested that they do not constitute an aspect of the fuel profile. Interestingly this profile fits with a site focused on cereal processing, particularly the parching phase, where 'turves' are used in a hearth context. However, there is limited evidence otherwise for significant processing at the site, this would suggest that either unprocessed product was outsourced for processing or processed product was quickly traded out of the settlement and thus is not present significantly within the site record.

CEREALS/FARMED PRODUCTS: – In terms of abundance Barley as expected was the most common cereal grain constituent, interestingly representing grain in approximately equal proportion to chaff (Huntley: 2009). This potentially indicates that Barley went largely unprocessed at the Fishers Road East site, potentially by community cultural incidence only processed in smaller proportions when immediately needed. Further examination of Barley residues indicates predominance of hulled varietals, with a significant proportion identifiable as being the 6-row varietal, this is unsurprising and resonates with trends identified from the 1st millennium BC across Scottish sites (Huntley: 2009). There was a minimal presence of naked Barley within the identified assemblage, more common to early prehistoric (pre-1st millennium BC) communities (Huntley: 2009). The presence of naked Barley in such minimal amounts could also indicate incidental harvest from an arable field that previously grew the species, there is potential for such heirloom species to continue representation within a landscape post-intentional agricultural production. The next predominant cereal variant recovered was Wheat, but these residues were dominated by chaff (Huntley: 2009). Indicating perhaps the recovery of processing residues from the site or midden materials, in any case this would cast doubt upon occasional processing of Barley, as suggested before, and instead suggest trends are down to serendipitous residue survival/recovery. In terms of the minimal Wheat grain residue, bread wheat, spelt and emmer are all present, but chaff residue seems to suggest a majority production of Emmer (Huntley: 2009). It seems likely that all Wheat and Barley varietals were locally produced, emmer and spelt grow reliably on well-drained manured sediments whilst bread wheat can tolerate heavier clay-based sediments, these sediment profiles are all evident in the immediate vicinity of the Fishers Road East site (Huntley: 2009). Oats were a rarity in the Fishers Road East assemblage with minimal chaff residue, thus inhibiting identification of either wild or cultivated species. In all likelihood, as cultivated Oat varietals are uncommon archaeologically prior to the 1st millennium BC, the residues present at Fishers Road East are *Helictotrichon sp.*, a wild oatgrass (Huntley: 2009). A further note regarding processing at the site is possible due to record of 35 culm nodes, which suggest at least primary processing of indeterminate cereal at the Fishers Road East locality (Huntley: 2009). The minimal nature of arable processing residues at the site may simply indicate, if not due to preferential preservation, an increased use of secondary arable products, straw used as bedding, etc. instead of being destroyed (carbonised) or discarded (midden material). Other potential agricultural species are few and potentially under-represented, due to not requiring fire in any capacity during processing thus reducing potential for carbonisation. These are Flax (*Linum usitatissimum*) and Pea (*Pisum sativum*), the two seeds of Flax recovered could indicate secondary production of oil (linseed) or fibre (linen) (Huntley: 2009). The arable/farmed product profile of the Fishers Road East site is distinctly diverse and suggests a relatively sophisticated arable agricultural system focused on cereals using a polyculture methodology, the product of which may have then been largely outsourced for processing. Those taxa classified in this case as arable weeds, would seem to be largely indicative of nutrient enriched, moist sediments, neutral to mildly acidic in nature, in terms of arable potential this would appear to represent the premium surrounding land (Huntley: 2009).

WILD SUBSISTENCE PRODUCTS: – Of particular note, are numerous fragments of carbonised *Fucus* (Brown) seaweed. As already explored in the Whittingehame and Standingstone profiles, such seaweed species have potential as a fertiliser resource, this use is particularly assigned to Viking/Norse contexts as in such situations there is an obvious ubiquitous state. This is particularly a trend evident throughout sites situated on the northern Scottish coasts, sites such as Orphir and Howe being exemplar (Dickson: 1995). It should be considered that the coastline closest at 8km to the Whittingehame site is not optimum for seaweed growth, as the majority of common *Fucus* species prefer 'rocky coastline' with high potential for anchorage (Lappalainen et al: 2019). In contrast the coastline at the Fishers Road East site fits the optimum *Fucus* habitat profile, ultimately indicating potential for a specialised supply chain between sites, and the consideration that such a resource could have been prioritised for the main Traprain Law site. Despite the 'blown sand' present in Fishers Road East stratigraphies, the carbonised state of the *Fucus* fragments suggest that the appearance of the species is not purely incidental and instead is intentional for a predetermined specialised use, burnt and then discarded, deliberately or accidentally. The assemblage contains a significant number of 'sedge nutlets' however despite a number of suitable sedge species producing starch-rich rhizomes, there is no indication of their consumption (Huntley: 2009). Apart from obvious issues concerning preservation via carbonisation, a particular issue in regard to tuberous species, a non-process-based explanation regarding this trend is that levels of wild harvesting practiced at the Fishers Road East site are extremely marginal. Or that such practices were limited to supplementary wild species, not for example tuberous species which could be considered a substantial dietary constituent. Some quantity of Crowberry (*Empetrum nigrum*) was also recovered, in this case the inclusion could be incidental due to the species tendency to grow in close proximity to Heather (*Calluna vulgaris*), however the leaves and fruits of the species are edible if somewhat astringent. It should be noted that *Hyoscyamus niger* (Henbane) was also recovered at the Fishers Road East site, although with less commonality than at Fishers Road West. This species as already highlighted does have potential medicinal applications, however in such a low frequency it is likely that the species was simply a common ruderal i.e. a species growing on waste/abandoned ground common around sites of habitation. Whilst the 'tree/scrub' species identified within the Fishers Road East assemblage are judged insufficient in frequency to suggest use as a fuel constituent, all the identified species have edible aspects and are represented in sufficient number to reflect subsistence consumption practices. These species include Hazel (*Corylus avellana*, nuts), Hawthorn (*Crataegus monogyna*) and Elderberry (*Sambucus nigra*), incidentally all the aforementioned are common in Prehistoric Scottish assemblages.

2.3.4. Broxmouth

It should be noted first and foremost that Broxmouth is not the 'complete excavation' it is often primarily presented as in actuality many potentially illuminating archaeological techniques were not carried out. However, it is still commonly agreed within scholarship that Broxmouth represents a milestone of research into lowland Iron Age Scottish communities due to it being debatably the most complete investigation into a lowland Scottish Hillfort (Armit & McKenzie: 2013). The Broxmouth site is situated in one of the most fertile landscapes in Scotland, and on a minor rise within the coastal plain, approximately 25m OD it has capacity for visibility across to the south and west (Armit & McKenzie: 2013). Broxmouth is one of a great number of Hillforts within the East Lothian landscape and with a maximum enclosure size of 0.6ha has been described as an atypical Scottish Hillfort (Armit: 2005). Despite the issue presented by the Broxmouth excavation (1970s) having been carried out prior to widespread adoption of single context recording and consequently in some cases the recording of what would now be considered singular contexts as one conglomeration context, a chronology is defined for the site. There is limited evidence for pre-Iron Age occupation/interaction with the Broxmouth site, this is potentially confined to the Middle Neolithic. The next period of occupation appears to be the Early Iron Age, site Phase 1 (640/570-490/430BC), pre-Hillfort structure, the settlement appears at this point to already be substantial and constitutes, a large, palisaded enclosure, two obvious roundhouse structures, numerous associated timber-built structures and potential ironworking activity (Armit & McKenzie: 2013). Construction of the Hillfort began in Phase 2 (490/430-395/375BC), whilst Phase 3 (395/375-295/235BC) appears to have been a period of significant modification to the enclosure system resulting in Hillfort footprint expansion. Phase 4 (295/235-235/210BC) saw similar structural works and potential abandonment later of Phase 4 housing. Phase 5 (235/210-100/60BC) saw significant infilling of the Inner Ditch and West Entrance with midden deposits, with this infilling process continuing into Phase 6 (100/60BC-AD155/210) alongside site remodelling with a timber-walled roundhouse in the interior and a high-density occupation, surviving into the Antonine period, potentially beyond before site abandonment (Armit & McKenzie: 2013). Unfortunately, whilst significant archaeobotanical analysis was undertaken at the Broxmouth hillfort site, the majority of the residues are no longer traceable within the surviving archive and for much of what is recoverable minimal contextual detail is recorded (Armit & McKenzie: 2013). A systematic sampling scheme was undertaken at the site, with macrofossil material collected by hand and via sieved bulk samples, ultimately 75 palaeobotanical samples are known mostly in a carbonised state with some unburnt presumed modern contaminants (Armit & McKenzie: 2013).

FUEL: - Of the assemblage which is identifiable a number of charcoal residues are significant, predominantly Oak (*Quercus sp.*) and Alder (*Alnus sp.*) with less occurrence of Birch (*Betula pendula*), Hazel (*Corylus sp.*), Ash (*Fraxinus sp.*) and Hawthorn (*Crataegus sp.*) (Armit & McKenzie: 2013). This could indicate a dominance of wood materials within the Broxmouth site fuel profile however lack of complete and contextual data does not discount 'heathy-turf' or other sources as fuel materials at the site and only minimal comment can be made regarding material amounts. The charcoal assemblage would suggest a secondary woodland resource in close proximity to the site, which was established enough to continuously provide material throughout the occupation of Broxmouth.

CEREALS/FARMED PRODUCTS: –Within the remnants of the Broxmouth assemblage were quantities of Wheat (*Triticum sp.*), Barley (*Hordeum sativum*) and Oat (*Avena sativa*) (Armit & McKenzie: 2013). Whilst no contextual data exists for these samples, the indication is that the Broxmouth community had a relatively diverse cereal-based diet. All the aforementioned species are conducive to growth within the Broxmouth environs, and so in all likelihood a significant proportion of the product was harvested within the vicinity of the Broxmouth site which could potentially have employed mixed cultivation strategy. This may particularly be the case as Vetch (*Vicia sp.*) was also present within the Broxmouth assemblage, without contextual data this could have been recovered in combination with cereal product, as a cereal-processing residue or as a 'weed' waste. Vetch (*Vicia sp.*) are frequently recovered in composite with cereal product, and theoretically this could be for a number of viable reasons, in the field as a reliable secondary crop that has an allelopathic quality, as a back-up famine crop, as a pest-control agent in a field context and in a storage capacity (Tilley: *ongoing*). Together this could indicate that the Broxmouth site utilised a sophisticated agricultural system, with in-built contingency for crop failure, companion planting and/or natural pest-control agents. The fertile qualities of the Broxmouth environs mean that it is probable that it has been a consistently high-yield area.

WILD SUBSISTENCE PRODUCTS: – Of note in this case, is the presence within the assemblage of charred residues attributed to Hazelnuts (*Corylus avellana*), this is a common aspect of wild subsistence practice at many Prehistoric sites likely because as a food product they exhibit a high nutrient content. For example, for raw hazelnuts, an 100g quantity supplies on average 2,630 kilojoules of energy, this same quantity would also account for 93% the daily required value of total fat need for an average adult human, and >20% of various essential nutrients (USDA National Nutrient Database: 2015). As at the Knowes site, relatively high quantities of Fat-Hen (*Chenopodium album*) within the Broxmouth assemblage could indicate its purpose as a secondary crop, however the species is also a significant prolific arable weed and thus could be assigned as an incidental inclusion or a processing residue. The wild harvesting practices at the Broxmouth site appear to have been minimal except in the case of Hazelnuts, which may be a heritage-based practice residual from when the species constituted a significant proportion of Scottish Mesolithic-Neolithic diets.

2.3.5. Biel Water

The Biel Water site was recorded as part of a salvage excavation, conducted within 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project undertaken by the GUARD archaeological unit, in response to upgrading of the A1 motorway. The site was situated on level ground approximately 20m AOD, to the east of Biel Water, the site is a Prehistoric enclosed farmstead with the excavation focused on remnants of a sunken structure (Lelong & MacGregor: 2008). The site is approximately 7.4km north-east of the main Traprain Law site, in a valley context overlooked by Traprain Law, situating both sites within the same landscape.

FUEL: - Occupation Layer 010, contained residues of birch, hazel and oak charcoals, with a hazel fragment providing a radiocarbon date for this activity of 410-200 BC (SUERC-8197). Later within the site occupation history in a midden layer (001), fragments of birch and oak charcoal were evident. Two fragments of birch charcoal from this midden layer provide a radiocarbon date of 390-190 BC (SUERC-8192, SUERC-8196). This would suggest that the fuel profile of the Biel Water site was dominated by mixed woodland species, in all likelihood this was secondary woodland and materials were largely deadfall and ground-collected. This would have impacted the local woodland environment minimally and is potentially a significant discord between the impacts on resource hubs by small singular/familial communities like Biel Water and inter-familial many household communities like for example Whittingehame or Fishers Road West.

CEREALS/FARMED PRODUCTS: – Occupation Layer 010 also contained heavily carbonised cereal grains, classified as indeterminate due to poor preservation. Burnt indeterminate cereals were again evident in the later midden layer (001). This confirms that cereals were an agricultural aspect of this site, it does not however prove aspects of cultivation or consumption.

WILD SUBSISTENCE PRODUCTS: – As with most of the discussed sites hazelnut shell was present, again in Occupation Layer 010. Presence of both oak and hazel within the charcoal assemblage also acknowledges the opportunity for acorn and hazelnut harvesting for dietary supplementation. Again, Hazelnuts are the only definitive evidence of wild harvesting practices at the site, the prevalence of this fact across sites suggests that this indeed may have cultural significance as a part of communal heritage as discussed in regard to the Broxmouth assemblage.

2.3.6. South Belton

The site of South Belton sits on level ground approximately 20m AOD, excavation revealed two significant pit features, filled with various typical midden materials, dating the site to the first millennium BC (Lelong & MacGregor: 2008). South Belton was excavated as part of 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project undertaken by the GUARD archaeological unit, in response to upgrading of the A1 motorway. The site is approximately 7.6km north-east of the main Traprain Law site, in a valley which Traprain Law has direct sight of, suggesting that there may have been a trading and defensive connection between the sites.

FUEL: - The contents of both Pit features at this site was essentially midden material, which indicates the community that deposited it were burning alder, blackthorn-type, oak, willow and elm (Miller & Ramsay: 2008). Blackthorn type charcoal from the lower midden layer radiocarbon dated to 760-400 BC (SUERC-8199), whilst Hazel charcoal from the upper midden deposit gave a rather anomalous radiocarbon date of 5210-4840 BC (SUERC-8198), suggesting early prehistoric remains of site activity were incorporated into the midden. The sites fuel profile is relatively diverse suggesting resource collation from mixed woodland, and a fuel profile focused on wood resources.

CEREALS/FARMED PRODUCTS: – Indeterminate cereal grains were present throughout the midden deposits of both pit features. This ultimately confirms some local agricultural involvement focused on cereals but does not prove cultivation at South Belton or consumption.

2.3.7. Eweford West And East

The associated sites of Eweford West and Eweford East were also excavated as part of 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project undertaken by the GUARD archaeological unit, in response to upgrading of the A1 motorway. The site of Eweford West seems to have witnessed intermittent activity spanning from the fifth to the first millennia BC, on the other hand Eweford East consists of two pit alignments and an enclosure structure dating to the third millennium BC (MacGregor & Shearer: 2002). The Eweford West site is situated approximately 30m AOD, on a marginal knoll which runs south-east to north-west (Lelong & MacGregor: 2008). The ground falls away from the site to the east to a field ditch, and to the east of this feature is Eweford East on relatively level ground, approximately 25m AOD (Lelong & MacGregor: 2008). Both these sites are approximately 9km east of the main site of Traprain Law, situating the site within the landscape of Traprain Law and within easy access to the coastline, a key resource-rich environment. The first constructed aspect of the Eweford West site appears to have been a low mound (049) in the first quarter of the fourth millennium BC.

FUEL: - Early on in the occupation of Eweford West a large sub-circular pit (094) was constructed and later back-filled with rubble, forming a low irregular cairn, among the stone back-fill potentially associated with burnt fragments of cattle bone were areas of exclusively oak charcoal (Miller & Ramsey: 2008). It would seem that these are waste food and fuel residues, discarded in the backfill potentially by those constructing the mound. Activities following construction of the primary mound were not limited to it, another back-filled pit feature (025) 30m south-west contains a deposit consisting of alder, hazel and oak charcoals (Miller & Ramsey: 2008). A sample of the alder charcoal from this context produced a radiocarbon date of 3960-3710 BC (SUERC-5298). Interestingly, as at Pencraig Hill, the mortuary structures (075) subsequently constructed at Eweford West primarily constituted oak timbers, the structures also seem to have had similar incineration events occur perhaps for the purpose of human cremation. All subsequent building activity at Eweford West also seem to have been characterised by the use of oak timber, with a few post-hole residues suggesting alder and hazel use. The monument builders of Eweford West similarly to those of Pencraig Hill also constructed screened-trenches, in the case of Eweford West the screen construction appears to have been wattle-work of hazel and oak roundwoods (MacGregor & McLellan: 2008). This like many of the Eweford West features was subsequently intentionally burnt, before a second screen-structure was built and again burnt, with a fragment of alder charcoal giving a radiocarbon date of 3800-3650 BC (SUERC-5286). Later in Pit (019) hazel, blackthorn-type and willow charcoal were deposited (MacGregor & McLellan: 2008). Whilst the fuel profile at Eweford West is slightly more diverse than that at Pencraig Hill it is still dominated by oak and strangely largely absent of birch which would have been ubiquitous within the landscape, thus birch was also probably reserved for specialist uses at Eweford West. Eweford East consisted of a line of 62 pits running approximately east-west in its earliest incarnation, Pit Fill 1114 at the eastern end of this alignment contained willow charcoal which radiocarbon dated to 2880-2580 BC (SUERC-5340) (Shearer & McLellan: 2008). Interestingly Pit Fill 1166 from the western end of the alignment provided radiocarbon dates of 2470-2200 BC (SUERC-5344) and 2470-2230 BC (SUERC-5345) from hazel and willow charcoal respectively (Shearer & McLellan: 2008). These radiocarbon dates define the span of occupation/involvement at the Eweford East site, where the charcoal is thought to result almost exclusively from intentionally burnt structural remains again most consistently of oak. Oak seems to have been the main material for structural support at Eweford East, potentially with woven screens of hazel and willow acting as walls, the blackthorn and cherry group species may have been integrated into the hurdling, the spiny branches having a visual and tactile effect (Shearer & McLellan: 2008). The diversity of the species within the Eweford East and Eweford West profiles suggests at least some access to secondary woodland, although the predominance of oak also suggests access to established primary woodland. Later at the Eweford West site a small Pit (028) was excavated and filled in part, with potential hearth residues, including apple-type, oak, hazel, willow and cherry-type charcoals (Miller & Ramsay: 2008). This suggests a diversification regarding wood species included in the fuel profile during the Late Neolithic – Early Bronze Age period at Eweford West. The variability represented in this assemblage could be a result of seasonality or local availability but could also have been purposeful symbolism, based on species perception (Hayman: 2003).

CEREALS/FARMED PRODUCTS: – By 3020-2700 BC (SUERC-5294) an isolated Pit (101) had been both excavated and filled, at Eweford West, in part with burnt plant remains, residues included oak and hazel charcoal, hazelnut shell (SUERC-5294 radiocarbon date) and two grains of six-row barley (Miller & Ramsay: 2008). Pit 028 at Eweford West contained residues including a number of cereal grains some of which were identifiable as barley, radiocarbon dated to 2310-2030 BC (SUERC-5299). Pit 142 also at Eweford West alongside oak and hazel charcoal residues and carbonised hazelnut shell held approximately 2000 cereal grains, including a diverse range of naked barley, hulled barley, bread wheat and emmer wheat, with an associated radiocarbon date of 2280-2030 BC (SUERC-5296) (Miller & Ramsay: 2008). Another Pit (140) again contained oak and hazel charcoal residues, carbonised hazelnut shell and approximately 1000 cereal grains including again naked barley, hulled barley, bread wheat and emmer wheat, with an associated radiocarbon date of 2200-1940 BC (SUERC-5295) (Miller & Ramsay: 2008). Associated with these pits at Eweford West is a larger sub-rectangular pit (164), which contained approximately 25000 cereal grains, dominated by naked barley with half as much of the hulled varietal and with a smaller quantity of emmer wheat, again a small quantity of charcoal residue was present, predominantly oak and hazel with traces of cherry and alder (Miller & Ramsay: 2008). The associated radiocarbon date in this case is 2140-1910 BC (SUERC-5316). Yet another Pit (175) contained a similar deposit of 9000 carbonised cereal grains, mostly naked barley with some smaller quantity of the emmer and bread wheat varietals. Across the Eweford West site during this phase of activity it seems approximately 56,000 cereal grains were identified from fills and bulk samples (Miller & Ramsay: 2008). This seems to have been an act of ceremonial deposition prior to site abandonment, this is particularly convincing as no evidence exists of in-situ charring. The extent of this ceremonial deposition itself indicates a high degree of communal food security; the site situated in a landscape which was fertile enough for high-yield reliable agriculture. The choice of cereal products as a ceremonial deposition certifies the importance arable agriculture had within local mentality, the memoryscape associated with ceremonial interaction with the landscape. That one community singularly could dedicate such a simultaneous ceremonial deposition does not seem logical, instead potential is noted for intercommunity ceremonial dedication and early associations between settlements based on arable agricultural product and a ceremonial landscape with Traprain Law at its centre.

WILD SUBSISTENCE PRODUCTS: – As already noted features (025, 019, 1291) of the Eweford West site, alongside a charcoal profile contains some fragments of carbonised hazelnut shell, this is a wild subsistence product. In this context, as a waste back-fill, this hazelnut shell could have been a discarded by-product of those constructing the pit feature. Presence of hazelnuts as a subsistence product, particularly in such an early, Neolithic, context is quite in line with other Scottish sites. The later Pit 028 at Eweford West, also contained carbonised hazelnut shell, suggesting that the use of this wild subsistence product continued through the Late Neolithic-Early Bronze Age. Of more interest perhaps though are the carbonised rowan seed fragments from this context which would suggest that the berries of this species were also actively employed as a wild subsistence product. Within human Cremation Deposit 082 at Eweford West, 1750-1520 BC (SUERC-5354), were 6 Charred Bird Cherry Stones, potentially incorporated as an offering either pre- or post-cremation (MacGregor: 2008). Also, with human Cremation Deposit 031 at Eweford West, 1880-1680 BC (SUERC-5304), were purposefully included a number of carbonised hazelnut shell fragments and 22 burnt rowan fruit seeds (MacGregor: 2008). That potential ceremonial cremation offerings were chosen from wild subsistence products, speaks to the connection communities had with environmental resource hubs and to the importance of wild harvesting practices to early and even transitional communities such as Eweford East and Eweford West.

2.3.8. Eweford Cottages

The site of Eweford Cottages which was excavated as a constituent of 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' project undertaken by the GUARD archaeological unit, in response to upgrading of the A1 motorway, sits approximately 30m AOD on fairly level arable ground (Lelong & MacGregor: 2008). The site is approximately 9km east from the main Traprain Law site, and so situated within the same landscape but with no direct visibility due to the local geomorphology between sites. The site appears to have had its main phase of activity during the first millennium BC with the construction and occupation of an enclosed settlement, however, there seems also to have been scattered earlier activity with for example pit excavations in the mid-third millennium BC (Lelong & MacGregor: 2008). It should be noted that ditches dug around this site before the 3rd/4th millennium BC provide easy transport access toward the ancient mortuary site at Eweford West and indeed the hill of Traprain Law, indicating interconnection in an earlier ritualized landscape.

FUEL: - At some point during the mid-third millennium BC a Pit (024) was excavated and filled with three distinct deposits (012, 017, 018), it seems likely that the abundant charcoal residues recovered in this context were hearth waste products, including alder, apple, hazel, willow, oak and elm (Miller & Ramsay: 2008). It would seem that there existed in this period a diverse fuel profile of primary woodland species, with little to no selectivity based on factors such as burnability. A fragment of apple charcoal from this context produced a radiocarbon date of 2890-2630 BC (SUERC-8179). Later in the site history a number of the ditches suffered neglect, silting up and being employed as midden dumps, samples of birch charcoal from Silts 096 (Ditch B) and 037 (Ditch A) produced radiocarbon ranges of 390-200 BC (SUERC-8172, SUERC-8178). Charcoal residues from these ditch deposits includes birch, hazel, blackthorn, alder, willow, heather and oak, presumably gathered from local mixed deciduous forests and heathland (Miller & Ramsay: 2008). Micromorphological analysis through Midden Fills 109 and 054 in Ditch B identified residues indicative of burnt turf, this alongside carbonised weed seeds from turf which grew on heathland or damp grassland, indicates a strong usage trend of turf at the site. This material may have been employed in various capacities in construction and then manually added to the midden deposit upon building destruction or refurbishment, alternatively turf may have been used as a generic fuel or indeed for the specialist use of cereal parching. The later unenclosed settlement also created occupation deposits, including 103 which was rich in birch, hazel and heather charcoal and burnt cereal grains, a fragment of hazel charcoal yielded a date of 40 BC-AD 140 (SUERC-8181). Context 101 appears to be an area where hearth waste was dumped, as it has inclusions of both burnt and unburnt birch, hazel, oak and heather charcoal and carbonised cereal grains (Miller & Ramsay: 2008). The diversity of the fuel profile appears to decline with the later unenclosed settlement, this is the antithesis to the trend exhibited at Phantassie where by the Roman Period greater species diversity consistent with prosperous secondary woodland is exhibited. The increasing presence of 'turves' residue is however consistent with trends at East Bearford and Phantassie, where the resource became monopolised for the purpose of cereal parching.

CEREALS/FARMED PRODUCTS: – A grain of emmer/spelt wheat was recovered from midden deposit 061 and gave a radiocarbon date of 350-340 BC (SUERC-8176), placing many of the site contexts within the Iron Age. All of the site midden fills contained burnt cereal grains, most abundantly six-row barley (hulled and naked), as well as emmer wheat, spelt wheat and oats in lesser quantities (Miller & Ramsay: 2008). These alongside burnt cereal chaff, cereal weeds and carbonised fragments of sub-surface heather stems, indicate on-site cereal processing. The site contexts are comparable to Phantassie and East Bearford, both of which in the later Iron Age intensified use of 'turves' for cereal parching. As expected, barley still dominates the assemblage as the most reliable crop species within the East Lothian climatological context. This was still the case in the later Iron Age/Roman Period as six-row barley was recovered from occupation deposit 103 of the unenclosed settlement, which yielded a radiocarbon date of 60 BC-AD 90 (SUERC-8182).

WILD SUBSISTENCE PRODUCTS: – Fragments of charred hazelnut shell were also recovered from Pit 024, further solidifying the ubiquity of this resource within the local area in the mid-third millennium BC. Apart from more hazelnut shell, seeds of elderberry and rowan indicate that berries were also wild harvested throughout the period of the enclosed settlement, 390-200 BC (Miller & Ramsay: 2008). This is intriguing as elderberry and rowan are not known for edibility, and although modern taste profiles are not applicable to archaeological contexts, commonly these species are more often associated with ritual offerings than subsistence constituents.

2.3.9. Foster Law

The Foster Law site was evaluated as a constituent of the Traprain Law Environs Project (2000-2004), the site itself is perhaps one of the most peripheral of those known and potentially associated with the main Traprain Law site, located approximately 8 km west-north-west (Haselgrove & Hale: 2009). The Foster Law site consists of a number of enclosure structures and ditches, potentially indicating presence of an enclosed settlement with an inner settlement pre-dating the outermost structures. A Hazel nutshell from Context (53) which is a cutting from a ditch structure, upon radiocarbon dating indicated a Late Iron Age date, specifically 760-400 cal BC (Haselgrove & Hale: 2009). However, radiocarbon dating associated with other site features, clearly recut in the Late Iron Age, seem to indicate that some form of permanent settlement existed at the Foster Law site since the Early Iron Age. The Foster Law site had bulk samples assessed from 19 separate contexts, this assessment indicated that a total of 3 contexts (4,15,53) had potential for further analysis, in the event however only a single context (15) was fully processed (Huntley: 2009).

CEREALS/FARMED PRODUCTS: – In terms of arable agricultural practice at the Foster Law site it seems that Hulled Barley and Spelt Wheat dominate what is admittedly a sparse assemblage (Huntley: 2009). Concerning the Spelt Wheat within the Foster Law context, it would seem that the species was potentially grown locally to the settlement or certainly processed there as only chaff residue remains of the species. The minimal weed taxa within the Foster Law assemblage on the whole indicate that surrounding land was well-manured potentially arable agricultural land, surrounded by waste ground (Huntley: 2009).

WILD SUBSISTENCE PRODUCTS: – The singular example of Hazel nutshell, could tentatively indicate that Hazel was naturally harvested from areas surrounding Foster Law, and constituted a minimal dietary factor.

3. TRAPRAIN LAW INVESTIGATION - SITE DETAIL

3.1. Introduction - Traprain Law

Many of the environs/peripheral sites demonstrate fuel profiles concordant with exploitation of secondary woodland resources, species such as *Betula*, *Corylus avellana*, *Salix* and *Alnus* dominate hearth contexts. Whilst *Quercus* is also incredibly common throughout the site assemblages, contextually this appears to be largely limited to construction purposes. Some of the sites also appear to have included 'turves' in what is a diverse fuel profile, these are potentially responsible for the concentrations of carbonised *Calluna* recovered from some sites, *Calluna* may also have been harvested and burnt as a singular resource however separate from the turf conglomerate. A select few of the sites, Whittinghame for example, demonstrate potential usage of coal within the fuel profile although this is uncommon and not temporally consistent. It would appear in regard to fuel that the Traprain Law environ sites relied heavily on wood resources from secondary woodland but would diversify fuel profile based on availability and potentially purpose/specialised usage. The cereal/farmed product profiles across the environs/peripheral sites are also broadly consistent with many dominated by six-row *Hordeum* (hulled and naked), with lesser quantities of emmer *Triticum*, occasionally spelt *Triticum* and bread *Triticum* are also present in lesser quantities. Those sites which maintain occupation post-Roman period also have higher incidents of *Avena*, though these are often also in lesser quantities, diversification of the assemblage is common in these sites with some incidents of flax, pea, radish and tubers. Those sites which demonstrate significant cereal assemblages also on the whole have significant deposits of processing debris, perhaps indicating a specialised site purpose. Wild subsistence product profiles see significant variation across the environs sites, the singular deposit which is present with some ubiquity however is hazelnut shell, whilst other deposits like elderberry, rowan, bird cherry, acorn, hawthorn, etc. are not so common. This would suggest that wild harvesting was not a significant aspect of subsistence for the majority of the environs sites and was primarily supplementary to a farmed product diet. There are many similarities held in regard to these profiles by sites throughout the Traprain Law environs, this could simply be resultant of maintaining lifescapes within the same environments, however probability suggests that with site proximity comes inter-site interaction. Many of these sites must have shared resources and with this in common, trade is probable. Potentially even to some level of interdependence as some sites appear to be focuses of arable agriculture whilst other communities in this respect are deficient, more specialised communities and resource exchange is one explanation for this.

Previous excavation data associated with Traprain Law has remained largely unconnected, this may be a result of the extensive yet chronologically distant excavation record of the site. Much previous work has been focused on defining the larger structures of the site summit this is particularly true of the earliest excavations of Curle and Cree (1914-1915, 1919-1923). Later studies have been admittedly more artefact focused with work undertaken on pottery assemblages (Campbell: 2012) and the significant proportion of metalwork recovered from the site, the Traprain Law silver hoard (Hunter & Painter: 2013) representing just one aspect of this. Traprain Law from its earliest excavation has been proved to be rich in artefacts many of which have been classified as 'high status' or 'decorative', yet little evidence exists to support on site production, except in a few select cases. Thus, a strong case has been made for long-distance imports, beyond the obvious Roman Empire origin of aspects of the Traprain Law hoard. This is with the exception of the numerous worked-shale artefacts mainly bangles which could potentially have been produced on site, as there are processing residues evident across the site in concentrations. The other notable exceptions are a number of clay moulds recovered in context with bronze cast pins and in one case a spear butt, in this instance it would seem that the production of small cast bronze objects was carried out on site. Whilst much has been recovered from Traprain Law there is still a significant amount to learn about the site, thus the 1999/2000 excavation aimed to define the nature of and date many of the upstanding features of the summit site whilst also determining the nature of the 'blank space' between these features. The assemblage recovered included both prehistoric-type and Roman pottery, miscellaneous iron objects, a Roman faience bead, coarse stone tools, struck lithics, evidence of cannel coal working, etc. As a part of the 1999/2000 excavation in excess of 140 samples including bulk and spot type were recovered, amongst other aspects this has contributed to a significant paleoenvironmental assemblage. Previously this has been a significant absence of data in regard to Traprain Law and will be addressed in this thesis. The contexts will be discussed in detail, including diagnostic aspects of the artefact assemblage, contextual details are the main recourse for assigning period to the Traprain Law 1999/2000 excavation data currently. All the contexts of the 1999/2000 excavation are associated with the Iron Age (39 BC-AD 124) or Roman period (AD 25-253), with some distinguishment in regard to middle versus late Iron Age (Kirby: 2016). The current project and national socio-health circumstances have not allowed for obtainment of radiocarbon dates for the Traprain Law site contexts, this is planned for inclusion in future literature.

The data of importance to this thesis is that collected during the 1999/2000 summit investigation which focused upon the 'Well/Spring' and the 'Pond/Tank', both areas which were previously neglected. The 1999/2000 excavation was principally carried out by individuals associated with the School of Archaeology and Paleoecology, Queen's University Belfast; the Department of Archaeology, University of Edinburgh; and the National Museums of Scotland. The archaeobotanical and palynological remnants were held by Prof. M. Church (University of Durham).

Much of the archaeobotanical assemblage and the entirety of the palynological sample originates from the 'Pond/Tank' feature. This is one of the more obvious features on the Traprain Law summit (Figure 3.1). Only at a time of inundation is the 'Pond/Tank' feature an atypical pond of standing water, more usually it is a marshy hollow of year-round saturated sediments. The 'Pond/Tank' was partially excavated by Cree (1923), in this instance Cree excavated approximately two-thirds of the feature and recovered between 0.2-0.3m of waterlogged material overlying a distinctive layer of bluish clay. Upon inspection the feature appears artificially modified, if not man-made, contained by a natural cleft in the bedrock and a stone slab on its north side, the parallel bank is less well-defined. It is highly likely that when Cree excavated the feature sealing material was removed, this would mean the environment was no longer stable and suggests the deposits may have been prone to gradual desiccation. This is particularly concerning in regard to the preserved organic deposits which were at medium to long term risk, excavation was therefore justified and Trench 3b was excavated across the feature (Figure 3.2). This accounts for paleoenvironmental Contexts 3127 (Sample 337), 3128 (Samples 338, 339), 3117 (Sample 336), Context 302 (Sample 309) and 305 (Sample TT3).

Trench 5 of the 2000 excavation season focused on the inner rampart of the summit, this is regarded as the earliest of the previously investigated 'ramparts', known usually as the inner rampart or 'Cruden 2'. Two points of the inner rampart have been previously excavated both by Cruden in 1939. The rampart underlays the 'Cruden Wall' which is a well-preserved stone rampart which quite obviously post-dates 'Cruden 2'. The 1999 Armit et al excavation, specifically Trench 6, suggested the inner rampart was highly denuded with the exception of deposits which had accumulated in the lee of the rampart (Armit et al: 1999). The purpose of Trench 5 was the collection of evidence for the construction and phasing of the inner rampart. The Armit et al (1999) discovery of accumulated deposits behind the rampart led Trench 5 to focus on possible preservation of in situ deposits in the lee of the rampart. Paleoenvironmental evidence was recovered from Context 512 (Sample 508) in this case.

Trench 6 of the 1999/2000 excavation was situated running down slope from the upper edge of the steep slope overlooking the main western shelf of the summit. This was the previous focus of much of the Curle and Cree involvement with Traprain Law and so many deposits are disturbed. The focus of the Trench 6 excavation was identification of the construction and phasing of the inner rampart, whilst also revealing continuation of the summit enclosure boundary, to further develop understanding of the stratigraphic relationship between the two features. Trench 6 was approximately 10m long east-west and 1.5m wide. The basal sediment layer of Trench 6 was a discontinuous soil horizon of dark brown-black medium-fine silt (605). There were some remnants of a rampart-type structure noted within Trench 6, suggesting it aligned with at least the main rampart feature. The paleoenvironmental evidence analysed in this case was recovered from Context 605 (Samples 201, 202, 203, 204, 205).

Trench D of the 1999/2000 excavation was located on the northern slope of an obvious hollow leading from the western terrace of the summit. It was suggested that the hollow may be a result of prehistoric structures, in any case the sheltered environment of the hollow was deemed optimal for potential preservation. The Trench D excavation would demonstrate that this area of the summit has complex and stratified archaeological deposits. Within the 4mx4m Trench D were the remnants of at least one built structure, potentially as many as three buildings. The nature of this potential structure is undetermined, however the lack of obvious 'domestic' refuse and indicators such as cannel-coal working debris suggest that the possibility of a craft function should be considered. The paleoenvironmental evidence analysed in this case was recovered from Context D105 (Sample 545).

Trench C, a 4mx4m trench excavated during the 1999/2000 excavation was located in a west-facing hollow on the western aspect of the summit, to the north of the south-west gateway. Interestingly an initial aim of Trench C was the comparison of nettle-rich and nettle-poor areas with underlying archaeological features, the southern half of the trench was an area of rich nettle growth. Specific modern plant growth has basis as an indicator for sub-surface archaeological features e.g., Bracken in regard to Bronze Age roundhouses (Wildgoose: 2016). Excavation of the southern half of Trench C was neglected due to bedrock interference in the south-east corner, excavation therefore focused on the northern half. The question of nettle growth in relation to subterranean archaeological features was unfortunately not investigated further. There are two clear phases of activity in Trench C, the first are deposits connected with a built structure, whilst the subsequent phases indicate a cobbled surface constructed over the building footprint. The walls of the built structure had stone foundations (C009), the eastern floor is earthen (C010), the floor to the west is a cobbled surface (C006) and there is a stone-built permanent hearth with two clear phases of use (C005, C011). It has been estimated that, assuming the structure is circular with a central hearth, the internal diameter would be approximately 6m which is quite sizable. Surface topographical survey seems to support the nature of this structure as a circular building. The Trench C paleoenvironmental evidence in this case was recovered from Context C004 (Sample 581) and Context C008 (Sample 584).

The northern perimeter of the summit of Traprain Law has been a point of controversy in terms of the degree of formalisation by wall, bank or palisade of the natural scarp which runs roughly east-west. Interpretation has been hindered by amongst other factors considerable rabbit damage particularly at the western extremity. The feature could represent an early phase of enclosure (Feachem: 1955) or just be a naturally occurring 'tenuous line of stone' (Jobey: 1976, 195). The 1999 excavation season thus saw Trench 4 located across the approximate line of the summit enclosure, 15m to the east of where it is presumed there is a juncture with the inner rampart. Approximate trench dimensions were 6m by 3m. Trench 4 confirmed that the summit enclosure is defined by wall remnants (404) at the point of excavation, the survival of both faces indicate that this feature was an upstanding boundary. A sondage cut through the deposits immediately inside the wall line, revealed an occupation-derived layer of sandy sediment containing charcoal flecks (408) and an ashy deposit (409). The paleoenvironmental evidence in this case was recovered from contexts directly related to the wall feature and to deposits abutting the wall, these were Context 412 (Samples 157, 156, 155, 154) and Context 409 (Sample 151).

Trench 7 of the 1999 excavation focused on a series of discontinuous surface boulder alignments, terraces or stone-banks which could represent former alignments of the Traprain Law inner ramparts. Specifically, Trench 7 focused on a particularly pronounced example referred to as Terrace 1. This area was chosen for excavation due to the significant rabbit erosion exacerbated by the cut of the main footpath to the summit which threatened the continued integrity of Terrace 1. The purpose of Trench 7 was to assess the purpose of the boulder alignments, which, if a part of the inner rampart would have significant interest regarding the development of the site and its longevity. Trench 7 measured 6mx1.5m and was located across the Terrace 1 boulder alignment at the point of most significant erosion by the footpath. What it revealed was a complex sequence of deposits with deposits either side of the faces of the terrace wall having no apparent stratigraphic links. The conclusion was that the boulder alignment is unlikely to be a constituent of a rampart or defensive enclosure but is rather a potentially monumental terrace wall. Like the wall of Trench 4 this terrace seems to have originally had a slab stone façade, supporting the suggestion of outward facing monumentalism from the summit of Traprain Law. Regarding the paleoenvironmental evidence of this report, however, Trench 7 is responsible for Context 709 (Sample 53), Context 715 (Sample 58) and Context 728 (Sample 62).

Whilst there is variation between contexts, ultimately the residues recovered from Traprain Law are minimal and poorly preserved. This is a consequence of the conditions in which the organics were held, namely sediments which have been disturbed or kept in a cycle of saturation and desaturation (drying). Trenches 4, 5, and 7 were severely affected by animal burrowing activity consequently preservation of undisturbed in-situ deposits was reduced. It is of little consequence that much of the damage is apparently 'historic' as the stratigraphy is disrupted, this process of erosion is still ongoing due to modern infestation of the site. Traprain Law is a popular site for visitors, which can already be linked to the occurrence of two major fires at the summit in recent years, this is a considerable threat to archaeological preservation. A rescue excavation was undertaken in 2004 following a severe fire in 2003 during which the southern fringe of the summit area was severely damaged along with isolated regions of the south, east and west upper slopes of the hill. Human activity, both benign and clearly destructive poses a consistent risk to the integrity of relatively shallow archaeological deposits on the summit. The trend of poor preservation is absent only in regard to the waterlogged layers of the 'Pond/Tank' feature which hold in excellent preservation a high density of artefactual, faunal and ecofact material. Assessment of these deposits in the field led to interpretation as later prehistoric midden deposits due to their composition and content. Other contexts have broader interpretations of hearth rake-out, floor occupation deposits and general discard. The assemblage in question constitutes plant macrofossils, charcoal and pollen palynomorphs as these are ecofacts closely associated with vegetation communities, through which interpretation of the Traprain Law community and community-environment interaction is intended. That is not to infer that the 1999/2000 excavation did not recover other artefactual evidence including pottery, metal objects, etc. these may be mentioned but the focus remains on botanic residues.

The research questions specifically in regard to the Traprain Law 1999/2000 excavation paleoenvironmental plant-based assemblage are as follows:

1. What is the nature and extent of subsistence and agricultural practice for the Traprain Law community?
2. What is the nature of the Traprain Law community fuel profile and what does this suggest about community-environment interaction?
3. What can be ascertained about the nature of the 'Pond/Tank' feature contexts and assemblages at the Traprain Law summit sites, specifically the nature or purpose of deposition?
4. What is the nature of the Traprain Law environmental context and its constituent vegetation communities?

The structure of this chapter is as follows, first following this introduction is a detailed breakdown of all the 1999/2000 contexts which produced the paleoenvironmental data discussed herein, this includes context description, method of sampling, relation to other contexts and review of recovered artefacts. The primary purpose of this chapter is the presentation of the new 1999/2000 excavation data, it should be noted that detailed descriptions of methodologies and processing will be included in the same sections as the new data and the analysis of said data. The first aspect of the new data assemblage introduced is the cereal deposits, after an in-depth methodological description the new data is presented in two categories that associated with the 'Pond/Tank' feature and that recovered from the wider site, any interpretation or analysis of data will also be integrated here. A similar format is then followed for the charcoal assemblage, again divided into that recovered from the 'Pond/Tank' feature and that from the wider site, again also preceded by a detailed methodological description and with integrated analysis. The same format is then used to present the new data in regard to the weed seed assemblage. The preliminary pollen data is then presented, again analysis will be integrated into the data presentation and a detailed methodology is included prior to this. Application of further techniques to this assemblage is then discussed, specifically the carbon and nitrogen isotopic methodologies and the benefits of this application towards assemblage interpretation. Following this first the carbon isotopic results then the nitrogen isotopic results are presented, in both cases with integrated analysis. This concludes the new data presented in this thesis and the extent of paleoenvironmental data currently available from the archives of the Traprain Law summit 1999/2000 excavation. Following this is the discussion section structured around pre-defined research questions and focused exclusively on the new Traprain Law data, broadly these research questions focus on the nature of community-vegetation and community-environment interactions. The chapter concludes with an evaluation of the limitations of the 1999/2000 Traprain Law paleoenvironmental assemblage and its analysis, also noting the significance the new data has to wider study.

3.2. Traprain Law - Assemblage/Context Detail

3.2.1. Pond/Tank Deposits

It was the original intention that the Pond/Tank deposits be sampled from a fully exposed section using a double column of Kubiena tins, this would have allowed detailed micro-stratigraphic analysis. However, ground conditions and significant groundwater waterlogging prevented column sampling via Kubiena tins (Armit et al: 2000). Instead, a 10mx1m trench was excavated across the northern bank of the pond feature to its approximate centre, this was Trench 3b (Figure 3.2). Placement of Trench 3b was intended to focus on deposits undisturbed by the Cree (1923) excavation, precise location was determined by previous coring of the feature. This constituted two coring transects across the eastern aspect of the feature using a Dutch auger. Regarding the sampled contexts, Context 305 constitutes a grey-brown sandy silt with inclusions of angular stones, prehistoric pottery and clear flecks of charcoal. This context underlays 302 and 307, potentially representing the lowest level of the feature as beneath is a possible manmade platform of cobblestones which seems to represent the base of the pond. The finds assemblage recovered from Trench 3 was substantial and ranged from modern glass to broadly prehistoric pottery sherds. All contexts within the 'Pond/Tank' and within the upper deposits behind the stone revetment held artefacts. This assemblage included >90 prehistoric pottery sherds, quartz flakes and shale/cannel coal working debris. The uppermost colluvial deposits contained some Medieval pottery sherds indicating perhaps that this was the last period of substantial activity at the site, with this not necessarily extending to occupation. The large proportion of prehistoric artefacts would seem to suggest that this is the main period of feature activity, with occupation and working debris. It should be noted that paleoenvironmental samples from Context 3127 (Sample 337) and Context 3128 (Samples 338, 339) also originate from the 'Pond/Tank' feature. A single section diagram of Trench 3 appears to indicate that Context 3128 is the lowermost of those excavated overlying the bedrock and underlying Context 3127 (Figure 3.2). Context 3117 (Sample 336) was also contained in Trench 3b, it is described as a rich, organic, waterlogged, pond deposit, it was confined to a small area at the south end of the trench. Context 3117 was the lower fill and contained unburnt bone, pottery and charcoal deposits.

3.2.2. Trench 5

Context 512 in Trench 5 consisted of highly concentrated angular stones with a small amount of mid-brown silt matrix, similar to Context 510 which it underlays. Context 512 appeared to have an edge to the east and may represent an eroded aspect of another deposit, Context 516. The rampart feature itself consisted of larger stone (513) with a smaller stone infill (507) and compacted earth fills to stabilize (504, 506 , 514 – possibly 505, 510). Context 516 which could have relation to Context 512, potentially represents a rampart foundation of angular stones. Artefacts recovered from Trench 5 include animal bone, glass (Roman?), a range of coarse stone tools, Prehistoric and Roman pottery, plus struck lithics. Material from within the rampart itself included cannel coal working debris, prehistoric potsherds and burnt bone. Whilst this seems to indicate broad prehistoric involvement with the feature, from the deposits within the lee of the rampart a sherd of Roman Black Burnished ware was recovered (from lowest excavated layer, Context 517). A large sherd of reworked Samian ware, atypical Roman pottery, was also recovered from within the latest levels, Context 511. Altogether this would seem to indicate that the rampart feature is associated with Iron Age and Roman Period activity at Traprain Law. Although the constituent aspects or materials of the rampart have links to earlier site activity, with a reused saddle quern present as construction material within the rampart.

3.2.3. Trench 6

As already stated, the Trench 6 Context 605 consisted of a dark brown-black medium-fine silt, this was the basal sediment layer of the deposit and was discontinuous. The basal layer was generally preserved on flatter bedrock (607) to a depth of 0.02m in average or in more significant deeper areas up to 0.1m, usually where the bedrock had erosion fractures. Context 605 ran beneath the remnants of the denuded wall (606/608). Overall burnt bone, coarse stone tools and prehistoric potsherds had relative commonality throughout all stratified soils (602-605). The first phase of activity evident in Trench 6 is represented by the basal soil horizon (605) and Context 604 which pre-dates the wall structure running beneath the remnants. These soil formations have not been formally dated however presence of the aforementioned artefact assemblage appears to potentially associate the deposits with early-mid Prehistory. This does not rule out Iron Age involvement with these deposits, as the assemblage profile is relatively ubiquitous throughout Prehistory.

3.2.4. Trench D

Context D105 within Trench D consists of a fine brown compacted silty spread, which overlayed but also partially contained a stone hearth setting (Context D104). This deposit extended to maximum dimensions of 1.2mx0.9m. The D104 hearth was formed by >16 principal stones and appeared divided centrally along its north-south axis. Perhaps most significantly Roman pottery was recovered from within the hearth stratigraphy, potentially indicating that the hearth was at least still in use during this period, specifically around the 3rd or 4th century AD. Although no obvious ash deposits or visible charcoal were found in obvious association with the hearth feature, raising the possibility that the Roman pottery was deliberately placed, as it has not been removed with apparent hearth rake-out. Of course, it could simply be that the hearth deposits have not survived well or been preserved in situ. In regard to the broader finds assemblage Trench D was highly productive with artefactual material recovered from all excavated deposits. Significant quantities of material are associated with Context D105 which seems to represent an occupation deposit specifically associated with the large hearth (D104). Within topsoil layers a sherd of 2nd-4th century AD Black Burnished Ware was recovered suggesting a potential termination date for the feature, although the sherds presence there could also be due to disturbance. No evidence of Roman occupation was recovered from residues below D105/D104, potentially this indicates that the structure is closely related to Roman occupation.

3.2.5. Trench C

In Trench C, Context C004 was beneath a cobbled surface and constituted a dark brown silty loam. Context C004 overlay the floor surface of the building remnants and was indistinguishable from C008 which filled the hearth. The structure revealed by Trench C extends well beyond the trench boundaries, with Context C004 appearing to be the main occupation deposit perhaps extending into the building abandonment. The hearth deposit C008 has potentially been affected by post-depositional processes and become stratigraphically homogenous with deposits including C004. The other explanation is that formation of deposits did not stall after the hearth ceased functioning, which is less likely as there is little other evidence for significant activity after initial feature abandonment. An assemblage of approximately 70 artefacts was recovered from Trench C, the most significant proportion of this from Context C004. Finds were isolated to select stratigraphic layers including topsoil (C001, C002), the cobbled surface (C003) and the significant occupation/abandonment deposit (C004). All pottery recovered is reliably of prehistoric-type, with the exception of a medieval rim-sherd from the uppermost topsoil (C001). Other artefacts included burnt animal bone fragments (C001, C002, C003, C004), various coarse stone tools (C002, C003, C004), and struck lithics plus working debris (mainly C003). Phases of use in this case indicate a Prehistoric focus, with intensification throughout the Iron Age and into the Roman Period, Early Medieval involvement is at most ephemeral.

3.2.6. Trench 4

Trench 4 or the 'Rampart' Trench included a main feature interpreted as a defensive structure which lays upon stony sandy sediment which has been classified as a natural subsoil, in this case Context 412. Context 412 directly overlays the summit bedrock or Context 411. Beneath the wall/rampart there was no recovered turf or topsoil, suggesting that the original construction did not have a turf component. A sondage was excavated through deposits immediately inside the wall line, revealing amongst other occupation-derived deposits, that the basal deposit was a layer of stony sandy soil (Context 410). Context 410 appears continuous with Context 412 beneath the wall/rampart; thus, it is potentially a modified subsoil which itself directly overlays the bedrock (Context 411). The finds assemblage in this trench was limited in quality and range of artefacts. Perhaps the most significant artefactual recovery came from the basal deposit inside the wall/rampart feature line (Context 410), this was a cannel coal bead of probably Iron Age date. Recovery of artefacts formed from cannel coal material is unsurprising as the summit of Traprain Law also exhibits areas of specifically cannel coal working. The only other stratified material in Trench 4 originates from Context 405 and Context 409 and is limited to burnt animal bone fragments.

3.2.7. Trench 7

In Trench 7, Context 709 was south of a stone alignment (Context 708) and beneath Context 706, from which it was only distinguishable by a significant presence of burnt animal bone and charcoal flecks. Context 709 is a compact brown and organic sandy silt deposit. Stratigraphical relationships were difficult to determine for this trench, as such the relationship between Context 708 and Context 709 is undetermined. Elsewhere within Context 709 there is another stone alignment, at the south-east corner of Trench 7, this stone cluster in some cases appears dressed, but yet again its relationship to Context 709 is unclear. There is a compact brown sandy silt layer (Context 715/716) which commonly runs beneath Context 707, Context 708 and Context 709. This common context (Context 715/716) has a number of features cut into it including an irregular oval hollow (Context 714) which was filled with two angular stones and a loose brown sandy silt (Context 713). Beneath Context 715/716 was a gravelly deposit (Context 722) which is cut by an irregular feature, 0.3m wide and linear, labelled Context 721. Feature (Context) 725 was filled with a dark grey-brown friable silty sandy sediment (Context 728). Context 725 was a circular cut through Context 722, it was sealed beneath a large flat stone. These latter features could simply be an incidental effect of burrowing animal erosion, a particular issue at Traprain Law. There was a relative abundance of artefactual data recovered from Trench 7, despite the limited excavation context. A significant selection of coarse stone tools plus working debris and later prehistoric pottery sherds were recovered throughout the contexts. Several of these sherds derived from deposits which underlay and therefore precede the construction of the terrace (Context 715/716). This suggests that at its earliest the terrace feature (Context 715/716) is most probably Iron Age. Many significant Roman artefacts were recovered from upper contexts, for example a fragmentary Roman faience melon bead was recovered from the topsoil (Context 700). Traprain Law is a site with which many higher status 'luxury' items are associated specifically in the Roman Iron Age. Context 709 was particularly rich in these artefacts as a sherd of Samian ware pottery was recovered which is archetypally Roman, alongside a piece of dressed sandstone and a miscellaneous iron item, tentatively labelled a Roman seal box lid. Apart from suggesting the high-status nature of the Traprain Law settlement in the Roman Iron Age and the obvious Roman-indigenous trading links, more specifically these artefacts suggest activity behind the terrace wall (Context 715/716) during the Roman Iron Age. These artefacts also aid in defining the approximate construction date of the terrace (Context 715/716) to be Later Prehistoric (Iron Age) preceding significant Roman involvement with the site, potentially it was a construction in response to increased foreign presence.

3.2.8. Sampling Strategy

Sampling with the exception of that undertaken for the 'Pond/Tank' feature and natural spring focused on previously known archaeological features. The official strategy employed was total sampling (Jones: 1991) whereby every deposit which was deemed archaeologically significant was sampled to an extent. Personal judgement was used in regard to the extent of sampled material with obviously organic contexts having larger amounts of material recovered. The topsoils and more heavily truncated deposits generally went unsampled, although some topsoil contexts saw minimal sampling in order to provide a control variable for routine soil sediment testing. Bulk samples typically were of approximately 5 litres to ease the recovery of organics through wet sieving. In order for soil sediment tests to be conducted approximately 0.25 litres was taken in each case of routine sampling. The total sampling strategy employed in this case for both bulk and routine samples, has allowed for sampling of the sample population in the post-excavation context whilst still ensuring correct statistical representation of the organic assemblage. In post-excavation bulk samples were processed using a flotation tank (Kenward et al: 1980), with residues being held in a 1.0mm net and flot caught by both 1.0mm and 0.3mm sieves. All flots and residues once dried underwent rapid assessment to check for presence vs absence of ecofact and artefact typologies. Not all residues following this assessment appear to have been fully sorted, it is presumed that those with presence of ecofacts/artefacts were prioritized.

4. <u>TRAPRAIN LAW INVESTIGATION - NEW DATASET</u>

4.1. Traprain Law - New Dataset - Cereals

4.1.1. Introduction - Cereals

Cereals recovered from the wider Traprain Law site had been previously identified by Prof. M. Church, as such as an aspect of this project specimens from these contexts were simply measured and given a condition assessment (Table 4.1). The dataset from the 'Pond/Tank' context on the other hand had largely undergone no previous identification and so this was undertaken using the previously ID-ed samples as a reference collection along with a Cereal ID Manual (Hillman et al: 1996) (Jacomet et al: 2006) (Table 4.2). Specimens were assessed using these resources for morphological aspects unique to genus/species beneath a light microscope at magnification between 40x and 60x. The poor condition of many of the Traprain Law specimens meant many were not conducive to identification beyond genus/species, morphological details in most cases were insufficient to provide further taxonomic delineation. All specimens were individually measured using a calibrated light microscope, converted to millimeters (mm), measurements included length (y), width/diameter (x) and depth (z). All specimens were also weighed using a highly sensitive scale recording grams (g). Lastly all specimens were given a condition assessment based on the Hubbard & Al Azm (1990), preservation scale between P6 and P1, with P6 being 'clinkered' and P1 being 'perfect'. It should be acknowledged that some degree of subjectivity is involved in regard to applying this scale, in any case the poor preservation of many Traprain Law specimens justified classification as P6 or P5 residues. Specimens ultimately given a P6 or P5 condition assessment were excluded from further laboratory-based analysis due to increased likelihood of contamination. No chaff constituents, glume bases, rachis or spikelet forks were present within the majority of 'Pond/Tank' contexts. In some cases, this would have allowed a narrower definition for specimens, the few oat grains identified in particular may have been identifiable as either cultivated or wild derivatives.

4.1.2. 'Pond/Tank' - Dataset

(Table 4.2, 4.1)

The earliest investigations of the 'Pond/Tank' context marked it as the only possible context with excellent preservation potential on the summit, as its upper-level filling deposits of silty clay were relatively acidic (pH 4.7-5.2) and had high moisture (40-50%) and organic contents (18%). Interestingly the Traprain Law 1999-2000 Excavation recovered few examples of Oat one from Context 305 (Sample TT3) which is a Trench 3 residue potentially Iron Age in date. The aforementioned context was the lowest recovered during the 1999 excavation from the Pond feature, a potentially cobbled surface was recorded within the context and a number of fragments of Prehistoric pottery, the surface appears to overlay sediment potentially consistent with the 'green-blue' clay recorded by Cree (1923, 221-222). Of note is the fact that Sample TT3 from Context 305 is one of the richest, regarding plant macrofossil recovery, this could be a result of preferential preservation conditions in a waterlogged context (the Pond feature) but could also be used in support of the suggestion that the Pond feature itself served some aspect of ritual purpose. In terms of comparatives, it seems likely that the few Oats recovered from the 'Pond/Tank' contexts, specifically Context 3128 (Sample 338) and Context 305 (Sample TT3), were a wild varietal perhaps an accidental inclusion with other cereals, as typically agricultural schemes regarding Oat production date to the Roman Period or Later in Scottish contexts (Dickson & Dickson: 2000). Whilst many specimens from samples 337, 338 and 339 are indeterminate, there is a demonstrable dominance of *Hordeum* throughout with some presence of *Triticum*, specifically in those grains which allowed further distinction, Emmer *Triticum*. Morphologically the cereal grains recovered from the 'Pond/Tank' contexts are similar with a few minor outliers, some are obvious outliers such as the *Avena sp.* recovered from Context 3128 this was discounted from collective analysis as its dimensions are extremely distinct from *Hordeum* vs *Triticum*. Regarding specifically the *Hordeum sp.* assemblage, there are no significant outliers, but three specimens (x=<3, y=<5) which are distinct from the main grouping (Figure 4.1). A lowermost of this grouping has been classified as 'CF, *Hordeum*' and is from Context 3128, this context also has one other datapoint within the secondary grouping otherwise it is consistent with the dynamics of the main data grouping. The range of the main data grouping is as follows, length between 4.85 to 7.15, width between 2.95 to 3.85. It would seem that whilst there is some variation within the *Hordeum sp.* assemblage this is not distinct enough to suggest anything other than natural variation based on genetic or environmental factors. In fact, the narrowness of the morphological parameters described supports that the assemblage represents a single or few deposition events, with potential for the specimens to be from a singular growing season or similar growth conditions, although there is no certain way to demonstrate this and the argument balances on probability. Discussion of growth conditions is furthered in this study through carbon and nitrogen isotopic analysis. The *Triticum sp.* assemblage is less significant as there are less data entries however there is one clear data outlier (x=>3.5, y=>7), this is from Context 3128 (Figure 4.1). Otherwise, the main data grouping ranges as follows, length 5.15 to 6.7, width 2.35 to 3.15. In this case the *Triticum sp.* data assemblage is not significant enough to discuss wider trends, the outlier in this case whilst significant fits within an explanation of natural variation. Comparatively the main data groupings of *Triticum sp.* vs *Hordeum sp.* are distinct although with some significant overlap, generally *Triticum sp.* are smaller regarding width. Although dimensions vary significantly dependent of cultivar morphology and the conditions of growth. Interestingly however the *Triticum sp.* of the Traprain Law 'Pond/Tank' dataset mirror the length dimension of the *Hordeum sp.* dataset, indicating perhaps that *Hordeum sp.* are smaller than expected (Figure 4.1). The many specimens labelled 'Indeterminate' due to poor preservation obscuring morphologically characteristics necessary for identification, range across the main groupings for *Triticum sp.* and *Hordeum sp.* with many attributable to the secondary *Hordeum sp.* outlier grouping. Proportionally, *Hordeum sp.* constitutes approximately 45.7% of the entire 'Pond/Tank' assemblage with *Triticum sp.* and indeterminate specimens each constitute 25.7% consecutively, with *Avena sp.* being the least represented at 2.9% of the assemblage. This dominance is the case across all contexts, with the most common preservation average being P4, which despite representing relatively poor preservation allowed distinction of species and application of further analytical techniques. The 'Pond/Tank' feature as already noted could represent a context of ritual deposition, if so, plant remains do not appear to be a common item for offerings as the assemblage is minimal. The potential for the context having ritual significance rests almost entirely on the waterlogged nature of the feature and its placement on a high-status summit which visually dominates the landscape, the assemblage recovered from the 'Pond/Tank' context ultimately does not differ significantly from that recovered from the wider site. It seems more likely that this is an accidental deposition or run-off erosion from a midden context, the specimens are all in a carbonised state regarding preservation this would follow that they constitute a waste product. The 'Pond/Tank' cereal assemblage has little to connect it with the site prior to carbonisation and deposition, there are few atypical processing residues to suggest that the cereals were processed for consumption on-site. The weed assemblage is limited, and the minimal cereal-type processing residues may be associated with wild cultivars as all are indeterminate. Based on this alone it is possible to suggest that cereals were imported in a pre-processed state in some instances, the most likely responsible parties for supplying the main Traprain Law site with this significant diet constituent are the environs sites already discussed, this is further supported by the similar assemblages throughout.

4.1.3. Wider Site Contexts - Dataset

(Table 4.1)

On balance regarding the wider Traprain Law cereals assemblage *Hordeum* is dominant with a higher proportion of Hulled *Hordeum*, specifically the twisted varietal. This is largely in line with the trends exhibited by the other sites discussed and the wider Iron Age Scottish context. The next most prevalent cereal represented is *Triticum*, specifically the Emmer varietal with only a single example of Bread *Triticum* recovered from Context 412 (Sample 157). In regard to the singular Bread *Triticum* example (Context 412) this may be an incidental inclusion due to presence in the growth environment as a relict crop. Regarding cereal processing, evidence exists only for the Emmer *Triticum* varietal, in the form of residual glume bases (Contexts 412 and 409). This would suggest that potentially Glume-*Triticum* were stored within the Glume and processed on a need basis when required, weekly, monthly, etc. Thus, the last stages of Glume-based cereal processing were potentially undertaken directly at the Traprain Law site, this practice has generally been accepted to be the case in Iron Age/Roman Period contexts (Hillman: 1981) (Jones: 1985). Although the minimal number of Glume bases recovered could indicate processing directly at the site was not common practice and represents an isolated event. There is a high degree of similarity in regards to morphology in the *Hordeum sp.* assemblage recovered from the wider site with no major outliers (Figure 4.2). There is a single minor outlier, and this status is caused entirely by the specimen width which is >4. The aforementioned parameters for the main grouping are as follows, length between 4.2 to 6.65, width between 2.2 and 3.5. The range of variation visible here within the main grouping is greater than that exhibited by the 'Pond/Tank' *Hordeum sp.* assemblage, suggesting that the wider site assemblage is from multiple depositions and growth seasons, whereas the 'Pond/Tank' assemblage is more probably to be from a singular or very few depositions. Despite the increased variation within the wider site assemblage this is still within the parameters of natural variation based on genetic or environmental factors, though in this case it seems clearer that different growth conditions are evident potentially across multiple growth seasons. Though this is not supported necessarily by the isotopic data. The *Triticum sp.* assemblage for the wider site is again less significant as there are fewer data entries, in this case there are no clear outliers as the specimens are more dispersed although still a clear grouping (Figure 4.2). The main data group range is as follows, length 4.55 to 7.15, width 2.55 to 4.05. It is problematic to discuss wider trends with such a minimal assemblage, however all the variation exhibited in this case is consistent with natural variation. In the case of the wider site the main data groupings of *Triticum sp.* vs *Hordeum sp.* are indistinct, there is significant overlap. In contrast to the 'Pond/Tank' assemblage the average *Triticum sp.* length (y=5.73 – N-9, SDS-0.81) and width (x=3.3 – N-9, SDS-0.56) measurements are higher than that of the *Hordeum sp.* assemblage (y=5.1 – N-22, SDS-0.6; x=3 – N-22, SDS-0.46). This is likely because this data includes multiple contexts with greater variation in date range including some later in period (potentially Roman) that could explain the *Triticum sp.* morphology, this is further supported by the measurements not being drastically distant so as to be attributable to natural development processes. The few specimens labelled as 'Indeterminate' due to poor preservation obscuring the morphological characteristics necessary for identification, range across the main groupings for both *Triticum sp.* and *Hordeum sp.* although with the similarity between these two groupings no further comment can be made. When grouped by context there is no significant observable data trend within the *Hordeum sp.* data, there is significant clustering and data overlap. The majority of contexts roughly align to the Iron Age and Roman period in any case, although this represents thousands of years again no significant variation is evident. Perhaps the *Triticum sp.* outsizing the *Hordeum sp.* and the opposing situation in regard to the 'Pond/Tank' context could suggest that the 'Pond/Tank' context assemblage predates wider site activity, this would require further investigation. Similarly, when the *Triticum sp.* assemblage is grouped by context there is no significant trend revealed, all the visible variation is observable within the bounds of the most prolific *Triticum sp.* context, Context 412. Proportionally, *Hordeum sp.* constitutes approximately 64.7% of the entire assemblage with *Triticum sp.* and indeterminate specimens each constituting 26.5% and 8.8% consecutively. Most specimens originate from Context 412 which coincidentally also represents the largest collective of *Triticum sp.* proportionally across the wider site assemblage. Context 412 upon first glance is surprising as it was not artefactually rich and has been classified as a basal deposit underlying a defensive construct, however it is also potentially a continuation of Context 410 which is occupation-derived and potentially described as a midden deposit accumulating at the base of the outward face of the defensive feature. Interestingly P3 is the most common preservation classification across the wider site, indicating preservation potential contrary to predictions was better in wider site contexts than the 'Pond/Tank' feature. The wider site contexts are generally consistent with occupation deposits as discarded waste incidentally or intentionally, the lack of any significant concentration of cereal plant macrofossil remnants is problematic as so far at Traprain Law there has been no identified storage deposit. Despite Context 412 having potential as a midden deposit, even this is minimal suggesting usage as a site of deposition over a short time period. So far, the cereal plant macrofossil assemblage for Traprain Law is intriguing and doesn't seem consistent with the long-term or intensive site occupation previously suggested, the temporal issue may simply be due to the majority of contexts examined herein being Iron Age or Roman period in date. The question of intensity, however, is interesting as previous research has suggested the late Iron Age and Roman periods as the Traprain Law 'golden age' in terms of community prosperity. Simply put at Traprain Law there is no obvious storage context or significant evidence of cereal processing, taken literally this would either mean an occupation absence, major reliance on environs sites, an undiscovered midden context away from the main summit or site classification which does not include permanent occupation.

4.2. Traprain Law - New Dataset - Charcoal

4.2.1. Introduction - Charcoal

Two contexts from the Traprain Law 1999/2000 Pond/Tank charcoal assemblage had not been previously analysed, as such all specimens, 671 from Context 3127 and 12 from Context 3117, were sorted, visually assessed for condition, re-archived/classified and weighed (Table 4.3). All specimens were individually weighed using a highly sensitive scale recording (g). Condition assessment was based on the Hubbard & Al Azm (1990) preservation scale between P6 and P1, although adjusted to be relevant to a charcoal sample. From those specimens deemed of P4, P3, P2 or P1 condition a sample of 100 specimens was randomly selected from Context 3127 for further analysis. It was determined this would be an appropriately representative sub-sample for profiling the wider sample species and prevalence. On the whole the condition of the Traprain Law charcoal assemblage was good, with a high number of samples maintaining cellular structure and largely intact periderm, the average condition assessment across all specimens was P3. Further analysis constituted identification using a Durham University reference collection of specimens carbonised in conditions conducive to optimum preservation along with 'The Identification of the Northern European Woods' an identification manual (Hather: 2000). Individual specimens were first manually split in a transverse section to provide a clean plane to view cellular structure, details such as pore size and distribution, ray widths/presence and parenchyma patterns were examined beneath a light microscope at 40x to 60x for classification. Many specimens can be identified to genus/species level based on the transverse section alone, on only a few occasions was it necessary in this instance to examine the radial longitudinal section which follows the radius of the specimen in order to distinguish between related species. Where preservation and condition allowed tree-ring counts were also recorded. Throughout specimen examination where applicable radial cracks, pith, bark, tyloses, vitrification and insect degradation were also noted. From the Context 3127 samples identified, 10 of each genus/species were selected, where appropriate the largest specimens were preferred, for further laboratory isotopic analysis. These genus/species included *Quercus sp.*, *Salix sp.*, *Corylus avellana*, *Alnus sp.*, *Betula sp.*, it should be noted that *Maloideae sp.* was also included despite only 8 samples being available. Another context included here from the Pond/Tank at the Traprain Law site, Context 3128 (Sample 338, Sample 339) includes charcoal assemblages previously processed and examined by Charlotte O'Brien of Archaeological Services, Durham University. Samples from the wider Traprain Law site underwent similar processes of analysis conducted previously by Prof. M. Church (Table 4.4).

4.2.2. 'Pond/Tank' - Dataset

(Table 4.3, 4.4)

There are four contexts which constitute the charcoal assemblage for the 'Pond/Tank' feature, the most significant of these in terms of quantity is Context 3127 (Sample 337) from which >600 specimens were recovered. In this case a sample of 100 specimens was analysed in order to be representative of the wider context. Another context in question was of a less significant quantity with 12 specimens all of which were identified and further analysed, this was Context 3117 (Sample 336). The most common condition assessment for all contexts was P3, the preservation was exceptional in regard to Traprain Law standard. Whilst preservation was overall good due to the relatively acidic conditions (pH 4.7-5.2) and high moisture waterlogged nature of the sediments (40-50%), specimens suitable for further analysis were limited by morphology with approximately 63% judged too fragmentary for simple identification via microscopy. This is judged a result of assemblage nature prior to deposition not due to natural processes such as degradation or disturbance whilst in situ, the breakages are not obviously new and appear to have occurred prior to or more likely during the carbonisation process. The fragmentary and overall small nature of the specimens which have largely been identified as secondary roundwood would appear to indicate residues like those of an atypical hearth context. Exactly how these residues came to be deposited in a consistently waterlogged context is interesting, if indeed the 'Pond/Tank' feature has ritual associations then the charcoal residues may be related to some form of cremation. Otherwise as with the cereal specimens the charcoal residues may be an accidental deposition or run-off erosion from a midden context. Proportionally Context 3117 is dominated by *Corylus avellana* at 50%, followed by *Salix sp.* at 33.3%, with both *Quercus sp.* and *Betula sp.* representing as 8.3% respectively. The dominance of *Corylus avellana* and *Salix sp.* appears to suggest either a dominant secondary woodland environment or a preference for selectively harvesting species which more quickly regenerate. Of note is that *Corylus avellana* and *Salix sp.* are often targeted for coppicing management which greatly increases the wood resource available from one tree, and the quality of staves for construction purposes. Whilst some *Quercus sp.* is included in this assemblage it is minimal and could be a result of deadfall or off-cuts from site construction works, as *Quercus sp.* being typically slow growing is often reserved for other purposes than hearth burns. Proportionally for the sub-sample of Context 3127 the profile is dominated by *Betula sp.* at 30%, followed by *Alnus sp.* at 18%, *Quercus sp.* at 16%, *Corylus avellana* at 14%, *Salix sp.* at 13%, *Maloideae sp.* at 8% and a potential *Pinus sp.* specimen at 1%. There is greater variety in this sample although it is again dominated by a species which is highly suitable for coppicing management in this case *Betula sp.* The presence of *Alnus sp.* in relative commonality is also interesting as this is a species with a strong preference for growth in saturated sediments, as opposed to the other species, potentially this was recovered from a different area than the other resources. The summit site itself has areas of saturation, if this is indeed hearth rake-out potential exists for the *Alnus sp.* specimens to have originated on the summit and being from there used, due to convenience, to supplement pre-gathered resources. Of course, this resource could have been sourced in other saturated areas, but *Alnus sp.* is often preferred for other uses due to enhanced workability and hardwood qualities. Despite having a relatively low ignition point and low particulate rate making it also a good fuel resource, so it seems apart from convenience it is likely *Alnus sp.* would have been prioritised elsewhere like *Quercus sp.* It is slightly unusual for *Maloideae sp.* to be in potential hearth rake-out as these species are often prioritised for their workability and/or their fruits which are often beneficial supplements to cereal-based diets, for example *Malus sp.* (Apple Family). Some of the environs site charcoal assemblages demonstrate this degree of variety, some of which constitute ritual contexts (Pencraig Hill, Pencraig Wood, Eweford Cottages, etc.), potentially supporting the status of the 'Pond/Tank' feature as a ritual deposition site. Otherwise, the assemblage variety may simply be resultant of convenience and the casual harvesting of deadfall for hearth burning making species profiles entirely incidental. Where identifiable, ring-counts for Context 3127 ranged from 2 to 9 and had an average of 4.57 (N-51, SDS-1.75), with *Quercus sp.* providing the highest count. It should be noted that of the 100 specimen sub-sample only 51% were suitable for ring-counts. These relatively low ring-counts align with consistent collection of deadfall or secondary woodland harvesting for hearth burns, such narrow diameters of material would have usage as little else. The question still remains however as to the nature of the hearth and therefore the 'Pond/Tank' context, are the residues ritually significant or simple occupation debris/atypical hearth rake-out. Context 3128 (Sample 338, 339) is proportionally divided as follows, with indeterminate fragments excluded from totals, first Sample 339 was dominated by *Quercus sp.* at 49.2%, with *Corylus avellana* at 37.3%, *Betula sp.* at 5.1%, *Salix sp.* at 3.4% and *Fraxinus sp.*, *Ilex sp.* and *Prunus sp.* at 1.7% consecutively. Sample 338 of Context 3128 is proportionally as follows *Corylus avellana* at 44.4%, *Quercus sp.* at 37.5%, *Betula sp.* at 5.6%, *Prunus sp.* at 4.2%, *Fraxinus sp.* and *Salix sp.* both at 2.8% and lastly both *Maloideae sp.* and *Alnus sp.* at 1.4%. These profiles fit in with a context description of hearth rake-out despite the elevated *Quercus sp.* presence as in these deposits it consists of largely small low ring-count secondary/tertiary roundwood. The last context associated with the 'Pond/Tank' feature is Context 305 (Sample TT3), proportionally it breaks down as follows *Corylus avellana* 45%, *Betula sp.* 35%, with *Alnus sp.* and *Quercus sp.* both at 10%. This is a relatively minimal assemblage but still seems to reflect the trends previously discussed.

4.2.3. Wider Site Contexts - Dataset

(Table 4.4)

There are three further contexts which may be analysed to ascertain the charcoal assemblage for the wider Traprain Law site, although none of these are particularly significant in regard to number of specimens, they are still significant in their association with significant features of the Traprain Law summit. Context 412 is associated with the main 'Rampart' which has been a continual focus of Traprain Law investigation, the context itself is potentially an occupation-derived waste accumulation, deposited inside the wall line presumably temporarily awaiting movement to a more permanent waste disposal context. This would seem to logically suggest that the charcoal assemblage profile for this context fits hearth rake-out. Proportionally the Context 412 samples represent thusly, firstly Sample 154 which has a higher proportion (36%) of *Corylus avellana*, followed by *Betula sp.* and *Quercus sp.* both at 28% individually with *Alnus sp.* at 8%. Similarly Sample 155 is dominated by *Corylus avellana* (56.3%), *Quercus sp.* represents at 25%, *Betula sp.* at 12.5% and *Alnus sp.* is limited at 6.3%. Sample 156 of Context 412 is extremely limited in specimen numbers but proportionally represents thusly, *Corylus avellana* at 42.9%, with both *Quercus sp.* and *Betula sp.* again represented at 28.6% consecutively. The largest aspect of the Context 412 charcoal assemblage was recovered from Sample 157 and was in this instance dominated by *Betula sp.* at 30% but still was closely followed by *Corylus avellana* at 28.3%, there was also a relatively common representation of *Quercus sp.* at 23.3%. Otherwise Sample 157 also included the largest variation of species including *Ulmus sp.* at 8.3%, *Alnus sp.* at 3.3%, *Fraxinus sp.* at 3.3% and the few instances of *Maloideae sp.* in the wider site contexts at 3.3%. The near consistent dominance of *Corylus avellana* in this context and high percentage presence throughout the Traprain Law site adds weight to the potential of systematic coppicing management occurring within secondary woodland within the Traprain Law environs, as this would maximize this resource further. This is not entirely provable however as despite the fragments being roundwood in this case ring-count data was not collected although it is suspected that the majority of the Traprain Law ring-counts are consistent with those recorded from the 'Pond/Tank' samples, within the range of 2 to 9. This is consistent with coppice rotation which occurs atypically between 5 to 10 years, although cycles are dependent of the species coppiced, *Betula sp.* are usually harvested at 3-4 years, *Corylus avellana* similarly 3-6 years whereas *Quercus sp.* can be maintained in up to a 50-year cycle. In any case the species are more consistent with secondary woodland although the potential for residual primary woodland is not excluded as the classifications and species inherent with these classifications are not mutually exclusive. Context 412 also contained the only *Maloideae sp.* examples outside the 'Pond/Tank' feature is a point of interest, these specimens on balance of probability due to relative ubiquity are more likely to be *Crataegus* (Hawthorn) or *Sorbus* (Rowan-type) neither of which are particularly held in esteem for burning. Not only are *Maloideae sp.* largely not fuel-efficient they are also more likely to be prioritised for other purposes including dietary supplementation. A single sample was recovered from Context 409 with useful data contribution to the wider site charcoal assemblage, this was Sample 151. The trend of *Corylus avellana* dominance is perpetuated in this sample at 41.7%, although it should be noted that there is not a significant specimen count. This is closely followed by *Quercus sp.* at 33.3% and *Betula sp.* at 25%. Again Context 409 is likely occupation-derived specifically in this case being an 'ashy deposit', more likely hearth rake-out which was then deposited abutting the inner wall face, potentially again prior to relocation to a more permanent deposition site. This is a logical trend at high-status non-agriculturally inclined sites, waste could be deposited throughout the year abutting site defensive structures before being annually relocated during spring planting, allocated to different satellite settlements for agricultural application. The final wider site context is Context 605 which is again associated with the 'Rampart' feature although this time potentially predating it as a basal deposit running beneath the wall remnants. The sediment in question appears to be from a significant burning event or accumulated hearth rake-out, as it is a significant sized deposit of dark brown-black silt highly concentrated with micro- and macro-charcoal. The first sample in question is Sample 201 which represents proportionally as follows *Corylus avellana* at 38.5%, *Quercus sp.* at 30.8%, *Alnus sp.* at 23.1% and *Ulmus sp.* at 7.8%. Sample 202 is represented singularly by *Corylus avellana* at 100%, but it should be noted that this sample is limited to only two specimens. Sample 203 is similarly limited to *Quercus sp.* at 66.7% and *Alnus sp.* at 33.3%, with a specimen count of 3. Another limited sample in this context is Sample 204 which contains *Quercus sp.* at 66.7% and *Corylus avellana* at 33.3% with a minimal specimen count of 3 again. The most significant sample for this context in regard specifically to specimen count in Sample 205 which represents proportionally thusly *Betula sp.* at 50%, *Alnus sp.* at 35%, *Corylus avellana* at 10% and finally *Quercus sp.* at 5%. This is quite an unusual context, seemingly marginally less consistent than the others analysed, this could be due to stratigraphic disturbance as this was a focus area for previous excavation (Curle and Cree) however no signs of such were recorded in the excavation report. It could also be a result of this deposit potentially being earlier than others discussed, it does run beneath the wall line, however late Iron Age pottery was recovered from the deposit making it loosely consistent with other deposit dates. The other possible explanation is that this deposit is the result of a number of hearth rake-outs, something likely due to the size of the deposit, making it a composite of resources available across time and increasing likelihood of variation.

4.3. Traprain Law - New Dataset - Weeds

4.3.1. Introduction - Weeds

Ultimately the majority of weed seeds had undergone previous identification by Prof. M. Church, with the notable exceptions of Sample 337 (Context 3127), Sample 338 (Context 3128), and Sample 339 (Context 3128) all of which underwent examination for the first time but contained no weed remnants (Table 4.5). This means that no weed seeds were recovered from the majority of Pond/Tank contexts, and most of the subsequent data is associated with the wider Traprain Law site. Weed species underwent examination beneath a light microscope at 40x to 60x magnification in order to necessitate identification. Many specimens could only be identified to genus level due to similarities in morphology between classifications. A number of potential weed species specimens remain recorded as indeterminate due to problematic preservation conditions obscuring/removing identifying morphological features. Identification was undertaken using mainly a reference collection of comparative carbonised specimens supplemented by a number of journal articles including Wilson (1984). So-called ‘weed seeds’ usually refer to species which grow alongside crops in particular cereal species, but in this case all none cereal species will be noted in this section. Whilst most of the specimens discussed herein are arable adjacent some potentially wild harvested species will also be accounted for. Such assemblages are useful in a number of ways, firstly arable weed assemblages when recovered may infer what stage of crop processing a particular sample was at prior to carbonisation, in turn this may identify specific areas of a site which were specialised for stages of crop processing if a spatial analysis is undertaken (Jones: 1984) (Jones: 1987) (Stevens: 2003). More generally weed seed assemblages when environmentally profiled, that is to say assigned/grouped into the species most common growth environment, can indicate what environments existed surrounding a site. Ultimately the Traprain Law dataset is limited due to the less than optimum preservation conditions at the site and comparatively few ‘weed seed’ specimens were recovered although what has been recovered can still be considered diagnostic.

4.3.2. 'Pond/Tank' - Dataset

(Table 4.5)

There is an extremely limited weed seed assemblage for the Traprain Law ‘Pond/Tank’ feature, limited in fact to two contexts, Context 302 (Sample 309) and Context 305 (Sample TT3). The first of these is the smaller sample with only *Polygonum spp.* (Knotgrass) nutlets (4) representing as weed seeds. This is a prolific annual common to arable fields and wasteland, its inclusion with various indeterminate cereal/wild culm nodes and culm bases could distinguish the context as containing arable cereal processing debris but it is equally likely that these are incidental wild depositions. *Polygonum spp.* (Knotgrass) seeds can remain dormant for years requiring significant sunlight to germinate, which means the species is an indicator of disturbed sediments and associated with arable production. The species is relatively problematic to extract from cereal harvests and is quite often still present in the final processing stages, it may also be left in intentionally as it is an edible species so extraction is unnecessary. The most significant context in regard to the ‘Pond/Tank’ feature weed assemblage is Context 305 (Sample TT3), this is potentially the lowest level of the feature and is particularly high in organics due to the good, waterlogged preservation conditions. The sample contained *Brassica/Sinapis spp.* (Cabbage/Mustard) (2), *Chenopodium album* (Fat-Hen) (3), *Chenopodium/Atriplex* (Goosefoot/Orache) (2), *Plantago lanceolata* (Ribwort Plantain) (1), *Poaceae* undifferentiated (Grass) (2), *Polygonum spp.* (Knotgrass) (5) and *Rumex crispus/obtusifolius* (Curled Dock) (1). Broadly all of these species are consistent with arable agricultural fields and/or disturbed waste ground suggesting ultimately that these are either residues resultant of cereal processing or incidental inclusions from the actual summit site environment. The case for cereal processing residues in this case is marginally convincing as the sample also includes cereal grains and potential indeterminate processing debris (culm nodes, culm bases). If this is the case, then the deposit represents one of the initial stages of processing, as the above species would be classified as small-light weed seeds which could be removed during the winnowing process (Stevens: 2003). The presence of cereals also in this context does not exclude this being an initial processing stage as some quantity of grain is lost throughout processing no matter how optimised the process. If this is indeed processing residue it brings into question the nature of the ‘Pond/Tank’ as a ritual feature, as the deposition of waste products does not align with this intent. The potential remains for these to be incidental inclusions because the species listed also in some cases are reliable indicators for disturbed or waste ground, this is particularly the case for *Plantago lanceolata* (Ribwort Plantain) which is often cited in this respect. In either case the environmental profiles suggested indicate anthropogenic influences on the surrounding Traprain Law summit site and its environs. It also hints at the potential for Traprain Law to have some minimal role in the production/processing of the main dietary component of the community i.e. cereals, even if the small nature of the assemblage suggests this was minimal and not consistent. None of the weed species associated with the ‘Pond/Tank’ feature are particularly unusual or contrary to usual site profiles in the region. Though some of these species can supplement subsistence practices, in this case the number of specimens is too limited to suggest that this is the case in anything but an accidental capacity.

4.3.3. Wider Site Contexts - Dataset

(Table 4.5)

On the whole the recovered weed assemblage appears to indicate a waste-ground or marginal arable landscape, as many ruderals populate both these environments this is not unexpected. What is unusual is the exclusivity of this weed assemblage which appears to present a landscape completely consistent with waste ground and some arable activity. Species indicators include Cabbage/Mustard, Fat-Hen, Goosefoot/Orache, Ribwort Plantain, Grasses, Knotgrass and Curled Dock. Context 412 is one of those with some semblance of a weed seed assemblage, this context directly overlays the bedrock of Trench 4 which is closely associated with the summit rampart structure, it has been classified as 'natural subsoil'. The context is loosely dated to the mid-late Iron Age and is not an atypical occupation deposit, as such any inclusions may be accidental particularly when the sediment classification as natural is considered. In Context 412 Sample 154 the inclusions are as follows *Plantago lanceolata* (Ribwort Plantain) (1), *Poaceae* undifferentiated (Grass) (1), *Polygonum spp.* (Knotgrass) (1). These are all consistent with a general environmental classification of arable agricultural fields or disturbed/waste ground. It should also be noted that these specimens were recovered from a sample with cereal grains and a singular indeterminate aspect of processing debris (culm nodes, culm bases). This could indicate again initial cereal processing residues as the weed seeds mentioned are classified as small-light which is consistent with by-products of the winnowing stage of processing (Stevens: 2003). This could also easily represent accidental deposition due to natural factors, such as rodent infiltration or anemochory. It is also worth noting that cereal processing debris and some weed seeds are categorized as the less stable more fragmentary and fragile aspects of the plant, these aspects require good preservation conditions for continued presence in the archaeological record, the Traprain Law conditions on the whole were not optimum for the preservation of organics and as such these aspects may simply have degraded and not been preserved. Sample 155 also extracted from Context 412 contained *Chenopodium album* (Fat-Hen) (2) and various cereal grains. Sample 156 of Context 412 also contained *Brassica*/*Sinapis spp.* (Cabbage/Mustard) (1) alongside cereal grains and indeterminate cereal excl. grain fragments. Sample 157 from Context 412 was similarly limited to *Chenopodium*/*Atriplex* (Goosefoot/Orache) (1) and *Rumex crispus/obtusifolius* (Curled Dock) (1), in a sample with significant cereal grains and minimal other indeterminate material. The weed seed assemblage of Context 412 is minimal, the balance of weeds vs cereal grains suggesting that weed seeds are more likely an accidental inclusion in an end product than significant processing debris, though as already explored it does fit the initial processing stages profile in some respects. There are few other contexts which contain weed seeds, some like Context 706 (Sample 52) contain indeterminate rhizome fragments these however have little to contribute to analysis, all that can be stated is the potential for rhizome consumption by the Traprain Law community. Only Context 512 Sample 511 contributes further to this discussion, this context consists of high concentrations of angular stone and a mid-brown silt matrix and is associated with the 'Rampart' feature, again the context is loosely associated with the late Iron Age or Roman period. Included in this sample with a small number of cereal grains is *Brassica*/*Sinapis spp.* (Cabbage/Mustard) (1) and *Chenopodium album* (Fat-Hen) (1). The consensus in regard to the wider site weed seed assemblage is a plant community settled in an environment of arable production and/or disturbed/waste ground.

4.4. Traprain Law - New Dataset - Pollen

4.4.1. Introduction - Pollen

Trench 3, which bisects the Pond/Tank feature, represents one of the only site locations where preservation of waterlogged materials, organics and pollen could be expected, due to constant sediment saturation. Initial excavations in 1999 interacted only with upper-level filling deposits, silty clays with an acidic pH (4.7-5.2), high moisture (40%-50%) and organic content (18%), all this was indicative of lower deposits with optimum preservation conditions for ecofacts. The two other locations where pollen preservation potential is noted are both springs situated on the Traprain Law summit. Initial coring of Trench 3 provided the material for a preliminary pollen analysis as well as locating undisturbed stratigraphy and material ideal for further excavation. In general, the cores indicate a thick mat of fibrous organic material potentially associated with reed-like species, underlain by 0.15-0.25m of brown waterlogged sandy-silt sediment containing a relatively high percentage of organic material towards the profile base. In every instance stone impeded further coring depth at approximately 0.3m, this was later determined to be bedrock. In the case of this preliminary dataset most counts were undertaken to 150-300 grains with the exception of the 67-68cm bracket, where preservation was particularly poor and the samples in general less organic. Total Land Pollen for the preliminary dataset was 64%, meaning overall whilst preservation was acceptable the concentration of pollen grains was however very poor. Pollen identification was undertaken using the key in Moore et al (1991) and a modern reference collection. Preparation of the pollen core sub-samples followed standard procedures, this included acetolysis to extract cellulose, combined with hydrofluoric acid treatment and fine sieving to remove minerogenic residues (Moore et al: 1991). The highest standard of care was taken to ensure no contamination occurred between the sub-samples and outside sources, this included cleaning of instruments and surfaces with ethanol solution prior to and during processing, it also included practice in a sterile environment with no outside influencing factors e.g. significant air movement. The pollen diagrams themselves were prepared with the use of TILIA (Grimm: 1991-1993) and TGView (Grimm: 2004). Application of zonation in this case was problematic due to the imperfect preservation of the dataset, stratigraphically constrained cluster analysis was thus applied using CONISS (Grimm: 2004) to the pollen diagrams. The preliminary pollen data analysis for Traprain Law was undertaken by representatives of the original 1999/2000 excavation team and Durham University Archaeological Services.

4.4.2. Preliminary Investigation

(Figure 4.3)

The conditions as already stated within the 'Pond/Tank' contexts mean the feature represents the only potential area across the Traprain Law summit site, which is suitable for preservation of palynomorphs, the fill deposits presented a relatively high acidic pH, high moisture content with consistent waterlogged state and high organic content. It is the lower deposits beneath the assessed fill deposits which constituted the raw material for further palynological analysis, although other non-pollen palynomorphs may also have been preserved in these contexts they were not the focus of investigation and so were not noted. Whilst the rest of the site contexts were also relatively acidic ranging from 4.1 to 5.4, moisture and organic content ranged from 15-30% and 10-25%

respectively making palynomorph preservation impractical particularly as no distinguishable areas of waterlogging were extant. This highlights the first point of note in regard to the Traprain Law preliminary palynological analysis, that it is extremely limited, not only in its status as a preliminary investigation but also in the nature and range of contexts available for sampling. The nature of 'Pond/Tank' catchment means that the profile created by its analysis is targeted and potentially not representative of wider environments, as the 'Pond/Tank' catchment is small. The associated pollen zonation has been associated with various excavated contexts in order to indicate a general period date for environmental fluctuations as more accurate radiocarbon dates are currently unavailable. The uppermost pollen zonation is Zone 3 approximately 32cm in depth including the entirety of Context 3116 and around the uppermost 12cm of Context 3117, both of these are described as rich, organic, waterlogged deposits. The upper fill (Context 3116) can be broadly associated with the late Iron Age to early Roman period as prehistoric pottery and a shale/cannel coal ring fragment were recovered, both of which are a-typical of this timeframe. The nature of the deposits, with their high organic content gives them the appearance of rich, organic middens, if this is the case then palynomorphs may have been incidentally added to the catchment through the deposition of waste products this will supplement and distort the natural catchment process. This must be noted in analysis as it could inflate counts of species disproportionately or introduce species which otherwise would not appear in catchment. Zone 3 demonstrates high ascending *Poaceae* counts, alongside *Cyperaceae*, *Cardueae* (cf. *aster*), *Lactuceae* and *Plantago lanceolata*, all these species are potential indicators of open land with *Plantago lanceolata* particularly often classified as an arable agricultural or waste ground indicator. The significant counts of *Plantago lanceolata* alongside the presence of carbonised cereal, assert that arable agricultural practices were undertaken within the open Traprain Law landscape. With the exception of increasing counts of *Pinus sp.* there are no indications of arboreal encroachment with pollen frequency remaining low, implying again an open landscape. Previously *Pinus sp.* was practically non-existent within the counts, though it should be noted that due to grain morphology *Pinus sp.* is sometimes considered a contaminant or at least non-representative of local environmental dynamics, as it can travel airborne during dispersal for thousands of miles. This could be the case in regard to the Traprain Law assemblage but equally there could be coniferous woodland growth, it is likely that this would have been encouraged as such species are fast-growing multi-purpose resources. The flora represented in this Zone is quite diverse, excluding the aforementioned this includes minimal counts of *Cerastium*, *Caryophyllaceae*, *Cichorium intybus* (t.), *Ranunculus acris*, *Rubiaceae*, *Botrychium*, and *Polypodium*. Variety within an environmental context is often an indicator of established ecosystems suggesting that limited change has impacted the area outside the boundaries of a common regular taskscape. The emergence of this diversity within the pollen profile could as already discussed be attributable to the context nature, this is particularly the case as many of the species have arable association as cereal weeds and could be linked to depositions of cereal products. All the above species are consistent broadly with an open landscape, and with environmental subdivisions including pasture/meadow, arable fields and wasteland. Zone 2 is approximately 36cm in depth, beginning at a depth of 32cm and ending at 68cm, it includes the lower portion of Context 3117 and the entirety of Context 3127. Context 3117 as already stated is broadly late Iron Age to early Roman period in date and remains in nature as described, with the issue of potentially representing a midden deposit. Context 3127 has associated with it a single undiagnostic sherd of prehistoric pottery, as this context also underlays Context 3117 and the stratigraphy was noted as undisturbed, Context 3127 must predate deposition of Context 3117 and broadly terminate within the mid-late Iron Age. The significant assemblage of charcoal also associated with Context 3127 introduces the possibility that this is also a midden-type deposit, in which case the natural pollen catchment profile could again be distorted. Despite this the sediments of these contexts have been classified as less organic with generally poorer preservation levels, this could impact profile diversity and abundance negatively. The Zone 2 contexts also demonstrate quite a significant degree of pollen reworking, where grains have been essentially recycled where the recovery zone is not the original site of deposition. The quality of any commentary in regard to Zone 2 is thus suspect as the assemblage integrity is in question, the *Lactuceae* and Spike curves are effective proxies for the degree of reworking, and both are significantly elevated. The significant charcoal assemblage is not particularly represented in the pollen profile, whilst arboreal pollen is present it is not dominant. Although there is some momentary increase in *Betula pubescens* before this again decreases, this could indicate more engagement with secondary woodland management but could also be natural recovery. On the whole regarding species increase/presence there is *Cyperaceae*, *Caryophyllaceae*, *Cichorium intybus* (t.), *Lactuceae*, *Plantago lanceolata* and *Ranunculus acris*, this plus a dominance of *Poaceae* fits an environmental profile of open land, specifically waste land, pasture/meadow and potentially arable fields. Zone 1 is approximately 31cm in depth, beginning at 68cm and concluding at 99cm, it includes the entirety of Context 3128. This is a lower context excavated in regard to the 'Pond/Tank' feature, it has some sherds of undiagnostic prehistoric pottery associated with it and must predate Context 3127 as it is underlying. Prehistoric artefacts are dominant in the 'Pond/Tank' assemblage with the main Traprain Law occupation period as the Iron Age, making Context 3128 as a lower context consistent with a broadly prehistoric date in all probability Iron Age but potentially earlier. There is a dominance of *Poaceae* in Zone 1 on a level with that exhibited later in Zone 3, this suggests a long history of open landscape dominance, elevated levels of *Corylus*-type, *Lactuceae* and *Plantago* support this interpretation. Arboreal pollen levels are consistently low with potentially minimal secondary woodland representation in elevated *Corylus*-type, this could equally however be non-arboreal species of *Corylus*-type or *Myrica*. There is significant diversity represented in Zone 1 this includes *Cyperaceae*, *Caryophyllaceae*, *Artemisia*, *Cichorium intybus* (t.), *Lactuceae* and *Polypodium*. This would suggest an established open landscape ecosystem, unaffected by change outside the boundaries of the established taskscape. The elevated presence of *Plantago lanceolata* alongside presence in Context 3128 of carbonised cereals would suggest some preoccupation within the open landscape with arable agriculture. Zone 1 has a complex taphonomy with some evidence for a degree of reworking although not to the extent of that in Zone 2. Throughout later prehistory Traprain Law dominated an open landscape constituted of arable fields, wasteland, pasture, meadow and disturbed ground. The suggestion is that this continued maintenance of open systems and arboreal clearance practices was due to factors including population growth and arable agricultural expansion. The profile mirrors that of Fishers Road West in the mid-late Iron Age.

5. TRAPRAIN LAW INVESTIGATION - NEW DATASET – SECONDARY ANALYSIS

5.1. Traprain Law - New Dataset - Secondary Analysis - Introduction

In order to gain further understanding from the plant-based assemblage, secondary methods of scientific analysis have been applied specifically carbon and nitrogen isotopic analysis. The Traprain Law data focused research questions can be more effectively addressed as a result of this application, specifically those focused on determining the nature of subsistence and agricultural practices. This is because carbon and nitrogen isotopic analysis can inform on factors such as the growth conditions of a specimen, due to suggesting when levels of carbon or nitrogen are increased or decreased (Bogaard et al: 2013) (Fraser et al: 2013). An increase of elemental carbon might suggest a saturated growing environment whilst increased elemental nitrogen in a specimen could indicate growth in supplemented sediments, both of which could be explained by anthropogenic interventions. The methods are not without interpretive complications, carbon isotopic value variability can have other explanations due to a network of factors such as evapotranspiration, temperature, sediment dynamics/characteristics, etc. (Flohr et al: 2019) (O'Leary: 1995). The same issues and more are applicable to nitrogen isotopic analysis. In modern isotopic studies it is possible to account for and negate the influence of these factors to some extent, because the specific environmental data associated with cultivation such as soil characteristics and climatological conditions are known. In archaeological contexts these factors cannot be completely mitigated, and interpretation is therefore key, alongside studies which impose classification systems or qualitative descriptor bands, for example a specimen which is high in elemental nitrogen and high in elemental carbon might be described as potentially 'supplemented with high-nitrogen material' and 'poorly watered'. Classification systems themselves have issues as they are fundamentally interpretive and there is liable to be some degree of diffusion between descriptor bands, however as long as this is recognised, classification allows numerical values to exist in an interpretive framework that has greater association with anthropogenic factors and introduces human agency. Much is dependent on the specimen under isotopic analysis, in this case cereal grains and charcoal fragments (largely secondary limbs) were analysed. For example, elements (e.g. seed, fruit, secondary stem) within the same plant are liable to exhibit differing elemental carbon or elemental nitrogen readings because each part of a plant functions differently (Hall et al: 2008) (Gröcke et al: 2020). And still plants are not simple organisms, different species are affected differently by the same factor, a perfect system of artificial supplementation for one species could represent a potentially fatal excess to another, for example in some instances increased elemental nitrogen in sediments which should logically benefit growth has instead been demonstrated to inhibit germination (Gröcke et al: 2020). It is not even so simple that 'perfect growth' and 'high yield' are coexistent, botanically speaking 'perfect growth' would be a specimen plant without any non-natural influencing factors involved in growth, with no aspect of morphology in excess and no impact from pests or disease, in other words a plant which independently without stress, exists (Gröcke et al: 2020). At times the label 'high yield' is at odds with 'perfect growth', if a specimen is high yield, it suggests that the growing environment has been optimized by anthropogenic factors, in some cases the plants genetic code may even have been manipulated in favour of this specific characteristic. These are aspects to be aware of but whilst the interpretation and vocabulary may be complicated the method is ultimately justified because of the potential for revealing further details of how the Traprain Law community existed within its environment, proactive or passive. The entire process of applied isotopic analysis was optimised so far as possible with care taken to avoid sample contaminations and best practice safety measures observed. Percentage chance of successful data recovery was prioritised with all specimens undergoing preservation classification based on Hubbard & Al Azm (1990), with all lower quality preserved specimens, those of P6 and P5 classification being discarded from further analysis.

5.2. Traprain Law - New Dataset - Secondary Analysis - Isotopes

The preservation of the Traprain Law cereal assemblage was not optimum with most grains representing as either P5 or P4, for this reason a number of P4 specimens were included in isotopic analysis, which is not standard procedure. This was intended to ensure the best possible probability of usable results, which would have relevance to a wider context and confirm any data trends. Each specimen was individually labelled and processed to a powder through implementation of a mortar-pestle type system, this residue was then weighed using a highly sensitive closed-atmosphere automated scale to an amount between 0.8-1.2 micrograms for carbon isotopic analysis and 10-12 micrograms for nitrogen isotopic analysis and subsequently this sub-sample was tightly enclosed in a foil casing. The carbon and nitrogen stable isotope analysis of these samples was performed using a Costech Elemental Analyser (ECS 4010) connected to a Thermo Scientific Delta V Advantage isotope ratio mass spectrometer. In this case the carbon isotope ratios are corrected for 17O and reported via the standard delta (δ) notation in per mil (‰) relative to Vienna Pee Dee Belemnite (VPDB). Whilst the nitrogen isotope ratios are reported against atmospheric nitrogen (AIR). In accordance with procedures of the Stable Isotope Biogeochemistry Laboratory (SIBL) at Durham University, isotopic accuracy was monitored through the routine analysis of in-house standards, stringently calibrated using various international standards (incl. IAEA-600, IAEA-CH-3, IAEA-CH-6, IAEA-N-1, IAEA-N-2, NBS 19, USGS24, USGS40). These international and in-house standards are run daily and indicate a linear range for $\delta^{13}C$ between −46‰ and +3‰ and regarding $\delta^{15}N$ between −4.5‰ and +20.4‰. The analytical uncertainty regarding carbon and nitrogen analysis in this case was typically ±0.1‰ (standard deviation 2) for replicate analyses of international standards and <0.2‰ for replicate sample analysis. Finally, the total organic carbon and nitrogen was obtained as an aspect of isotopic analysis using the internal standard, glutamic acid (40.82 wt% C, 9.52 wt% N). Significant care was taken to prevent contamination throughout sample processing, this included cleaning of equipment and surfaces prior to and during (between samples) preparation using an ethanol solution. Contamination potential was also reduced by best practice measures including wearing of gloves at all times and no direct contact/handling of samples. It should be noted that a number of charcoal specimens from the Traprain Law assemblage also underwent isotopic analysis, in this case preservation was significantly better although inclusion of some P4 specimens for some less prolific species was necessary. In any case, the procedure itself in preparation for isotopic analysis remained the same as did the parameters of the processing itself.

5.2.1. Isotopic Analysis - Carbon

5.2.1.1. Introduction – Carbon Analysis

Carbon isotopic analysis in relation to archaeological cereal residues usually focuses on environmental/climatological inferences regarding the conditions in which the cereal crop was cultivated, in this case particularly of interest is the extent to which the cereal plants were exposed to water. Specifically, this could potentially infer presence in either abundance or scarcity (plant-drought) of water, a significant source of elemental carbon, and thus presence potentially of intentional schemes of irrigation. There are many potential explanations for carbon isotope variability which complicate interpretation, these include related factors such as evapotranspiration, which is itself a process affected by temperature, and soil characteristics such as water retention capability, soil typology and depth (Flohr et al: 2019). Carbon isotope variability is also affected by factors beyond water availability including salinity (Isla et al: 1998), light intensity (O'Leary: 1995), temperature (O'Leary: 1995) and nutrient supply (Serret et al: 2008). While logical reasoning can be undertaken in order to account for variation in modern situations where the specifics of cultivation such as climatological data and soil characteristics are documented, this presents an issue in regard to interpretation of archaeobotanical residues. In order to mitigate this so far as possible, the classification system developed by Wallace et al (2013) will be applied in this case, the levels of crop water status in this interpretative model are poorly watered, moderately watered and well-watered. These categories are associated with $\Delta^{13}C$ (‰) ratios, whereby a higher $\Delta^{13}C$ value is associated with greater water availability. This model is not without faults, of note is that the cut-off points between levels are not fixed. There is also a noticeable difference between brackets implied based on field observation (Wallace et al: 2013) and from published observations of a different environment (Riehl et al: 2014). Similarly, carbon isotopic analysis in regard to charcoal is problematic, as tree species appear to be able to partition elemental resources via a method which means that isotopic signatures can differ from one part of the tree to another (Hall et al: 2008). In regard to charcoal isotopic analysis in respect to applied methods, it is a useful paleoenvironmental indicator for temperature, humidity and precipitation, although correlation of carbon isotopes and humidity is most reliable (Hall et al: 2008). Carbon isotopic values seem to be minimally affected by some anthropogenic practices such as arable manuring, instead interpretation of water levels or water management systems and sediment typologies or cultivation sediment preference are possible (Senbayram et al: 2008). It should be noted that the relationship between specimen ratios, elemental carbon resources, and some anthropogenic practices is not fully understood, often due to the many influencing factors on levels obscuring effects/trends. Both elemental increase and elemental decrease are evident in experimental studies often in relation to the same anthropogenic practice i.e. manuring (Wallace et al: 2013). Variation of elemental carbon values dependent on plant element (e.g. primary stem, seed, fruit, secondary stem) is logical as each aspect functions differently constituting differing biochemical reactions, some elements only uptake ^{13}C incidentally (Gröcke et al: 2020). The seed or fruit elements of a species should, due to their functions, thus demonstrate increased ^{13}C compared to for example a primary or secondary stem (Gröcke et al: 2020). Seeds in general have a more significant carbohydrate concentration than other aspects of the plant, carbohydrates are more easily described as demonstrating increased ^{13}C than for example cellulose (a fibre component), lipids (fats, non-protein) and lignin (complex organic polymer) (Gröcke: 2002). The $\delta^{13}C$ values herein, reflect amongst other factors the ^{13}C (CO_2 - elemental carbon) assimilated by the plant, this is complicated as the atmospheric carbon fluctuates naturally across time. Thus, in order to better compare plants grown in different periods, $\delta^{13}C$ values should be normalised relative to the variation in atmospheric CO_2, this is usually denoted by $\Delta^{13}C$ (Eggleston et al: 2016) (Ferrio et al: 2005). The formula is as follows:

$$\frac{\delta^{13}C_{air} - \delta^{13}C_{plant}}{1 + (\delta^{13}C_{plant}/1000)} = \Delta^{13}C$$

The $\delta^{13}C_{air}$ measurements were taken from the work of Eggleston et al (2016) which chronologically lists the necessary atmospheric carbon adjustments.

5.2.1.2. Carbon Analysis - Cereals
(Table 5.1)

Typically, the Traprain Law region climatologically is not an obvious area for significant water stress, which would cause less stomatal conductance within the plant specimens and therefore less potential for carbon inlet through the stomata. Overall, however, the assemblage isotopic carbon values are lower, supporting a relatively high incidence of water stress in the region. This is likely resultant of the light nature of the Traprain Law sediments, demonstrating low retention of water reserves without anthropogenic organic supplementation via manuring (Figure 2.3). This is the probable cause of a trend in the data which suggests specimens which originate from growth conditions which are nitrogen supplemented are less commonly classified as water-stressed. Sediments which have higher organic contents are in general more able to retain water reserves. This in turn suggests that some specimens may be from more regulated growth contexts, potentially more official arable agricultural systems. There is no clear trend associated with the preservation notation allotted to each specimen and the $\delta^{13}C$ (‰) ratio recorded, specimens compared in this way do however exhibit greater value diversity potentially due to associated levels of contamination or preservation condition extending to chemical damage. The conditions of preservation do have an obvious effect on the $\delta^{13}C$ ratio, this is unavoidable as carbon exchange during fire-induced preservation (carbonisation) is a natural chemical process. This is not on the whole amendable as the effect is highly individualised based on the chemical profile of the specimen and the fluctuating conditions of preservation. On the other hand, cereal grain dimensions seem minorly connected to $\Delta^{13}C$ ratios (Figure 5.1). Generally, specimens with greater dimensions exhibited marginally higher $\Delta^{13}C$ ratio value inferring potentially a greater access to water resources and minimal water stress, although there are many exceptions to this trend. This makes logical sense as in most instances access to water is necessary for growth, specifically prioritisation of fruit/seed production. A specimen plant which experiences water stress has less resources to dedicate to fruit/seed production and the resultant products are likely to be inferior i.e. smaller. This effect would be visible in the transaction of elemental carbon and thus in decreased $\Delta^{13}C$ ratios. In regard to $\Delta^{13}C$ values there is a minimal degree of variation within tested barley subsamples of CF *Hordeum*, *Hordeum* (Hulled) and *Hordeum* (Naked) (Figure 5.2). Although there are some minor potential outliers in both the Hulled *Hordeum* and Naked *Hordeum* subsamples these are not so distinct as to represent different growth conditions. When $\delta^{13}C$ ratios are translated into $\Delta^{13}C$, the Traprain Law barley assemblage broadly falls into the 'moderately watered' category as defined by Wallace et al (2013), although some samples also categorize as 'poorly watered' (Figure 5.2). There is no significant variation demonstrated when $\Delta^{13}C$ ratios are considered in relation to context, except that all specimens exhibit some variation within contexts although even this is minimal. Some contexts have closer relation than others Context D105 (Sample 545) for example is particularly consistent whilst Context 305 (Sample TT3) exhibits more value diversity. Levels of water-stress are relatively consistent across contexts, suggesting that this is a common factor within the Traprain Law arable agricultural system, the incidents of specimens which are 'poorly watered' are not contextually isolated. This minimal data variance is further supported by calculated standard deviation for $\Delta^{13}C$ values in relation to *Hordeum*, which is relative to the nature of the dataset considered to be a low standard deviation (1.09). It should be noted that the *Triticum* assemblage analysed in relation to $\Delta^{13}C$ ratios for the Traprain Law summit site is of a less significant size, this may therefore effect discussion of wider data trends as less data is available. In regard to $\Delta^{13}C$ ratios within the *Triticum* sub-samples of CF *Triticum*, Emmer *Triticum* and Bread *Triticum* there is minimal variation. These values are closely comparable to those evident in the *Hordeum* assemblage, although in general the *Triticum* assemblage exhibits lower $\Delta^{13}C$ values <17‰ whilst *Hordeum* specimens reach <18.8‰ (Figure 5.3). This is entirely compliant with expected data trends as *Hordeum* specimen thresholds are typically 1-2‰ higher than those of wheat, this is a species characteristic whereby the grain typically has greater capacity for elemental carbon storage (Wallace et al: 2013). This is further demonstrated by the assemblage $\Delta^{13}C$ ratio mean averages where *Hordeum* (17.53‰ – N-26, SDS-1.09) is higher than *Triticum* (15.75‰ – N-12, SDS-0.71). The ubiquity of *Hordeum* growth in prehistoric Scotland was resultant of the suitability of the varietal for the climate, *Triticum* whilst grown was a later addition because in the conditions it was less hardy requiring greater anthropogenic supplementation. The single specimen of *Triticum* (Bread) does exhibit some separation from the bulk of the *Triticum* assemblage, although not enough to suggest differing growth conditions it is more in line with lower threshold of $\Delta^{13}C$ ratio *Hordeum* levels. The $\delta^{13}C$ ratios when translated to $\Delta^{13}C$ ratios, interestingly places the Traprain Law wheat assemblage into the 'poorly watered' category with some potential diffusion it the 'moderately watered' specification (Wallace et al: 2013) (Figure 5.2). Admittedly some consideration should be given to this classification system as it is dependent on a number of figures, all of which in this case are variable, for example atmospheric carbon. It does indicate however that the Traprain Law *Triticum* assemblage in particular is significantly water-stressed, this may be resultant of some *Triticum* varietals requiring more water for satisfactory growth and this need not being met, or the Traprain Law *Triticum* assemblage remaining non-supplemented due to status as a secondary crop with resources focused primarily on *Hordeum* production. In any case the Traprain Law *Triticum* assemblage demonstrates significant water stress in comparison to the *Hordeum* assemblage which whilst non-supplemented does not indicate so much water stress (Figure 5.3). Variation in $\Delta^{13}C$ ratios is more significant in regard to the *Triticum* assemblage when it is considered in relation to context, although much of this variation is internal within samples. The single Bread *Triticum* specimen from Context 412 (Sample 157) is still the most significant outlier in this regard, suggesting that the varietal itself is liable to water uptake on a level with *Hordeum*. The specimen may even be a relict crop grown within the same conditions as some of the *Hordeum* exemplar. Otherwise, the specimens associated with Context 305 (Sample TT3) again display the greatest internal variation, indicating potentially a slightly more dynamic water supply. It should be noted that variation is not significant enough across the Traprain Law *Triticum* assemblage to suggest any more than natural water supply variation, with no marked evidence for periods of water excess. In fact, the *Triticum* assemblage itself is reflective of sustained periods of water dearth with no obvious indication of anthropogenic correction. This is all consistent with the calculated standard deviation for the Traprain Law *Triticum* assemblage which in relation to the nature of the dataset is considered a low standard deviation (0.71). A single specimen of *Avena* underwent further analysis, demonstrating a carbon isotopic result (19.65‰) $\Delta^{13}C$ ratio, consistent with the upper threshold of the wider cereal assemblage which is on the whole accordant with low $\Delta^{13}C$ values and water stress conditions. Considered in more detail the *Avena* specimen is relatively concordant with the uppermost *Hordeum* assemblage values and with the exception of a single CF *Hordeum* specimen (which is judged to have a high potential of contamination) represents the highest $\Delta^{13}C$ value in the dataset. This higher value nature of the *Avena* specimen may be resultant of species-specific characteristics, concerning required water uptake in comparison to both *Hordeum* and *Triticum* alongside the dimensions of the *Avena* grain typically being greater and therefore consisting of a more significant elemental carbon composition. The conditions of growth indicated are completely consistent with the natural system of the Traprain Law environs, when the nature of the light sediments is considered, whilst climatologically the region is not inclined to severe water dearth these sediments mean retention of water reserves is precarious (Figure 2.3). There is no indication within the dataset of water supplementation via anthropogenic methods such as irrigation systems. The suggestion is that the Traprain Law community and environs sites depended on the natural system for the water-based aspect of crop growth i.e. rainfall.

5.2.1.3. Carbon Analysis - Charcoal
(Table 5.2)

When charcoal assemblages undergo carbon isotopic analysis there are a plethora of factors which effect the certainty of any hypothesis, specimens from the same source tree can exhibit drastically different $\Delta^{13}C$ ratios. An arboreal source can at any point during growth partition its available resources to the effect that the isotopic signal of one aspect of the tree differs from that of another (Hall et al: 2008). This fractionation may be associated with periods of water stress where water resources are diverted to vital functions. All of the specimens analysed in relation to carbon isotopic data in this case originate from a single context, Context 3127 (Sample 337). This probably represents hearth rake-out deposits, as such the specific relation of each specimen is unknown, it is predictable that some specimens originated from the same source tree. However, the nature of the context as secondary waste products means that interrelation cannot be proven. As the entire assemblage is associated with a single context (Context 3127) this also means that discussion of wider site trends or temporal differentiation will be limited. The carbonisation of the specimens would have affected the carbon isotopic signatures obtained, specifically the effects are linked to the formation temperature and the isotopic values of the original wood (Hall et al: 2008). Wood intended for the purpose of fuel is generally collected in branch form rather than damaging the tree trunk and stalling a resource (Archer: 1990) (Abbot & Lowore: 1999). Whether the natural carbon signatures within a branch are preserved post-carbonisation is as yet undemonstrated. In general, $\Delta^{13}C$ values in carbonised specimens decrease relative to uncarbonised examples, due to the reducing and oxidizing effects of combustion. This is not a universal condition. During combustion moieties will either volatilize or concentrate, the proportions related to this are affected by the rate of temperature increase. If a specimen were to have different levels or types of chemical compounds, this could account for $\Delta^{13}C$ value increase. This may even suggest at the state of collection i.e. whether an uncarbonised specimen was collected in a live state or dry (dead) state. Collection in a live state means a specimen is liable to have a higher concentration of elemental carbon enriched volatile organic compounds which will lead to greater $\Delta^{13}C$ value decrease upon carbonisation. Status as an archaeological dataset means that commentary may only apply to the conditions of combustion and potential environmental water availability in relation to growth conditions. In regard to the $\Delta^{13}C$ (‰) ratios of the Traprain Law charcoal assemblage there is a significant degree of overlap between species sub-samples including *Quercus sp.*, *Maloideae sp.*, *Salix sp.*, *Corylus avellana*, *Alnus sp.*, and to some degree *Betula sp.* In fact, the range across the entire assemblage is minimal (5.73‰) potentially suggesting a fairly homogenous set of growth conditions in regard to supply of necessary water (Figure 5.4). At first glance the Traprain Law environs landscape is characterised as being dominated by grassland, pasture, arable field and waste land, this does not mean that conditions were uniform regarding levels of saturation, sediment viability, humidity, etc. (Figure 5.5). In this respect the Traprain Law landscape was varied, allowing the species sub-samples analysed to appear homogeneous as the varied growth requirements of each species are being satisfied to varying extents, *Alnus sp.* for example prefers more saturated conditions than *Quercus sp.* yet both are situated in regard to the $\Delta^{13}C$ ratios in the same close range. The distinct lack of $\Delta^{13}C$ variation in relation to species could suggest that some specimens such as the *Alnus sp.* may be comparatively water stressed compared to *Quercus sp.* specimens (Figure 5.6). The hearth conditions in which combustion and carbonisation occurred for the Traprain Law charcoal assemblage, due to the negative trend in $\delta^{13}C$ values (<-22‰), appear to be consistent with the average temperature range for a wood-fuelled hearth, between 100°C and 475 °C (Hall et al: 2008). A greater degree of variability would be evident within the assemblage, in regard to positive (-17‰) versus significantly negative (-31‰) $\delta^{13}C$ values had the hearth during combustion exceeded 475 °C as there is greater potential for breakdown of secondary products at higher temperatures (Hall et al: 2008). On the whole there is no clear link between the $\Delta^{13}C$ ratios, and the preservation assessment allotted to each specimen, in fact specimens examined in this regard appear to demonstrate more significant diversity. This is likely a result of those specimens with lower preservation ratings having associated levels of contamination and chemical damage, this would further distort Δ^{13}C ratios. Regarding specific species trends there is a little more variation (Figure 5.6). This is the case for the *Quercus sp.* sub-sample although not enough to suggest differing growth conditions or indeed origin from either a different hearth burn or indeed a different origin tree, nor is there a way to suggest the antithesis. Some *Quercus sp.* specimens appear to have had greater water availability than others with Δ^{13}C values ranging from 21.75‰ (greater water availability) to 18.58‰ (lesser water availability). This is within the range of natural non-exacerbated saturation levels and could even originate from the same tree. This is supported by the calculated standard deviation for the *Quercus sp.* sub-sample Δ^{13}C values, which relative to the dataset nature indicates a low standard deviation (1.12). Regarding the *Maloideae sp.* sub-sample of the Traprain Law charcoal assemblage, there is a more significant level of variation with a single specimen outlier at 22.98‰ with the rest of the sample ranging from 18.24‰ to 22.23‰. Whilst this is an outlier (22.98‰) it is not significant enough to suggest different growth conditions and is within the range of natural non-exacerbated saturation levels. At the most it suggests that a specific origin had greater accessibility to water or that at one period the region had more significant rainfall. It does more strongly support that Context 3127 represents multiple burning events and hearth rake-out deposits across different seasons potentially, although the size of the assemblage itself already suggests the first aspect of this argument. This single variation is not enough to impact the standard deviation calculation for this sub-sample however which, relative to the dataset nature, suggests a low standard deviation (1.47). The *Salix sp.* sub-sample for the Traprain Law charcoal dataset does exhibit some internal variation although again this is not significant enough to suggest disparate growth conditions or extremes of saturation outside natural seasonal parameters. As with the *Quercus sp.* assemblage some *Salix sp.* specimens appear to have had greater water availability than others with Δ^{13}C values ranging from 21.32‰ (greater water availability) to 17.25‰ (lesser water availability). The major concentration of datapoints is focused in the centre of this range, so the variability suggested is limited. Interestingly the *Salix sp.* group is one which on the whole prefers more saturated environments, the higher Δ^{13}C values exhibited in some cases support the suggestion that areas of saturated free-draining sediments potentially close to running water sources existed within the boundaries of the Traprain Law environs. However, the *Salix sp.* dataset does present the possibility of minor water stress, as the species is water-tolerant, yet the Δ^{13}C values are comparable to the less tolerant *Quercus sp.* specimens. The calculated standard deviation in this case supports minimal variability, when related to the nature of the dataset, with a low standard deviation (1.12). The *Corylus avellana* sub-sample of the Traprain Law charcoal assemblage exhibits limited internal variation with Δ^{13}C values ranging from 18.3‰ to 21.15‰. This range is marginally lower than that of *Quercus sp.* and *Maloideae sp.* but relatively concordant with the upper threshold of the *Salix sp.* assemblage, this is unsurprising as both species have a preference for well-drained sediments which do not have a high nutrient content, although *Salix sp.* is more inclined to higher saturation levels. The majority of datapoints are <20‰ in Δ^{13}C value, with two outliers at >21‰, this is not significant enough to suggest over inundation or more than naturally occurring levels of saturation. The low variability of the *Corylus avellana* sub-sample is confirmed, in relation to the nature of the dataset, by a low standard deviation value (0.91). The *Alnus sp.* sub-sample of the Traprain Law charcoal assemblage when compared to other species sub-samples is not so varied, with Δ^{13}C values ranging from 18.02‰ to 20.41‰. This range is more comparable to that of *Salix sp.* and *Corylus avellana*, which is relatively unusual as *Alnus sp.* prefer growth conditions which are saturated, specifically habitats like marches, wet woodland, or like *Salix sp.* proximity to running water. It is expected therefore that the Δ^{13}C values would be higher, as there is a greater water uptake expected with *Alnus sp.* This would suggest that although the Traprain Law *Alnus sp.* sub-sample does have appropriate levels of water accessibility it is not as exposed to these resources as other sub-samples, despite it being a group with a preference for saturated environments. There is thus the possibility of water stress, although this as with *Salix sp.* is minimal. There is no indication of severe water stress or inundation suggesting that availability was within natural saturation levels for the region, in regard to the *Alnus sp.* sub-sample. The limited variability of this sample is supported by the calculated standard deviation, which when considered in relation to the nature of the dataset, fits the profile of a low standard deviation (0.73). The *Betula sp.* sub-sample for the Traprain Law charcoal assemblage is slightly variable with Δ^{13}C values ranging from 19.51‰ to 21.75‰. Whilst there is variation it is not significant enough to highlight any extensive environmental change or to suggest different growth conditions. The *Betula sp.* Δ^{13}C value range is most comparable to the *Quercus sp.* and *Salix sp.* sub-samples, which is interesting as *Betula sp.* is typically tolerant of more saturated soils than *Quercus sp.* even to the extent of tolerating waterlogging. This would suggest that the *Betula sp.* specimens demonstrates a capacity for water stress, to a greater degree than *Salix sp.*, but perhaps on a par with the *Alnus sp.* specimens. Within the context of the Traprain Law environs there is a possible shortage of water retention vectors, the sediments surrounding the main Traprain Law site on the whole cannot hold saturation (Figure 2.3). That is not to state that localised conditions prevented *Betula sp.* growth, only that optimum conditions were not prevalent. The lack of variation in the Δ^{13}C values for the *Betula sp.* sub-sample is supported by the standard deviation figure, which when considered in conjunction with the nature of the assemblage, indicates a low standard deviation (0.90). The picture created of the Traprain Law environs is consistent with a naturally varied environment not necessarily in regard to typology but certainly in regard to conditions, as it seems to contain close to growth positive conditions of water accessibility cross-species (Figure 5.4). With the notable exception of potential minimal instances of water stress in *Salix sp.* and the more significant examples within the *Alnus sp.* and *Betula sp.* datasets.

5.2.2. Isotopic Analysis - Nitrogen

5.2.2.1. Introduction – Nitrogen Analysis

Nitrogen isotopic analysis in relation to archaeological cereal residues can be used to indicate aspects of an arguably more sophisticated arable agricultural system. Specifically, higher elemental nitrogen levels could indicate intentional manuring of the crop by communities and in some cases the extent of this practice in relation to the wider agricultural system. Beyond this some work has been done to explore potential indications of the type of 'manure' supplement used i.e. mixed midden waste vs animal manure vs seaweed. Isotopic nitrogen composition is capable of reflecting other aspects too such as aridity, soil amendment and even the process of nitrogen cycling intentional or supplemented (Fraser et al: 2011) (Nitsch et al: 2017). Due to significant experimental studies, it has been determined that δ^{15}N values higher than 3‰ are indicative of supplemented growth with manuring regimes (Fraser et al: 2011) (Bogaard et al: 2013). It should be noted however that experimental studies have also highlighted that implementation of terrestrial herbivore manures as agricultural sediment supplementation can increase δ^{15}N values by up to 10‰ in cereals (Kanstrup et al: 2011) (Boggard et al: 2007). This guideline will be employed in the analysis of the Traprain Law datasets, to determine the likelihood of agricultural soil supplementation and potentially significant resources used in the supplementation process i.e. seaweed. Interestingly it is not so simple as increased elemental nitrogen in sediments due to supplementation unequivocally meaning better growth or a more productive/successful arable crop, as demonstrated by Gröcke et al (2020) where supplemented plots demonstrated less germination, potentially due to increased organic compounds in the amended sediments also being favored by pest species. This same study indicated that no statistical difference occurred in plant height metrics in the control versus the amended sediments, contrary to the assumption that the greater the elemental nitrogen pool available the more 'verdant' or 'thriving' the specimen (Gröcke et al: 2020). Interestingly, these assumptions are particularly prevalent when considering methods of marine bio-fertilisation (algal, seaweed, fish), which purportedly have the greatest elemental nitrogen potential and are associated with increased green vegetation. Although this does not seem to be demonstrably the case (Gröcke et al: 2020), knowledge of incidents where supplemented elemental nitrogen does positively effect growth of green vegetation would be particularly beneficial when considering secondary fodder products extrapolated from arable resources. Of particular interest in regard to this study however is the positive relation between elemental nitrogen supplemented sediments and fruit/seed:plant ratio, amended soils have a higher productivity in relation to primary arable products (Gröcke et al: 2020). Beyond simply demonstrating supplementation of sediments associated with arable crops, some work has been done to help define the $\delta^{15}N$ (‰) values associated with specific supplement resources, macroalgae for example has a similar signature to terrestrial herbivore manures, whilst marine sources such as fish have significantly higher $\delta^{15}N$ values (Treasure et al: 2016). Whilst some supplement resources are indistinct from each other, for the purposes of this study higher $\delta^{15}N$ values are more likely to be resultant of supplementation with seaweed resources, as this resource has been recovered from environ sites on the East Lothian coastal plain i.e. Whittingehame, Standingstone, Fishers Road East. This study also undertook nitrogen isotopic analysis on Traprain Law charcoal residues from Context 3127, this was a stratigraphic context of the 'Pond/Tank' feature and consisted of >600 specimens of which 56 specimens underwent isotopic analysis. Of these 56 samples only 44 provided viable $\delta^{15}N$ (‰) ratios. Nitrogen isotopic analysis in regard to archaeological charcoal is understudied and no comparative archaeological datasets or accounts could be found to further the Traprain Law analysis, as such there are no parameters for sub-sample averages and interpretation is limited. What can be ascertained is the likelihood of growth within the same conditions, and it is possible to theorise as to the probability of collective growth within a singular woodland environment. Beyond this it is possible to postulate as to $\delta^{15}N$ increase or decrease, and thus the potential and extent of anthropogenic involvement within woodland environments. The analysis of the Traprain Law charcoal data will by necessity focus on theoretical interpretation as much more work needs to occur on the uses of such a dataset.

5.2.2.2. Nitrogen Analysis - Cereals
(Table 5.1)

The Traprain Law $\delta^{15}N$ dataset considered in its entirety does demonstrate some variation, values are high enough to suggest some degree of supplementation although the Traprain Law environs are not necessarily deficient in natural elemental nitrogen and are in the historical/modern context agriculturally renowned. Just as increased elemental nitrogen does not unequivocally prove better growth or a more productive arable crop, high $\delta^{15}N$ values do not prove supplementation particularly if control sediments have a high baseline, it is suggested that Traprain Law is to some extent naturally inclined to significant arable productivity when managed appropriately. Management would be necessary as the sediments in the region are light and not inclined to retaining of nutrients, so the elemental nitrogen baseline for the Traprain Law region in actuality likely varies from average to insufficient (Figure 2.3). There is no demonstrable link between the preservation notation allotted to a specimen and the associated $\delta^{15}N$ ratio in this study. However, in the case of those specimens with a P4 preservation rating, potential for disruption of accurate $\delta^{15}N$ assessment increases and this may be responsible for the any disparity within the dataset. There is no connection between cereal grain dimensions and $\delta^{15}N$ ratios, in some cases the specimens with greater dimensions, in line with species morphology, exhibit marginally greater potential for nitrogen supplementation as $\delta^{15}N$ (‰) values are higher this however is the exception (Figure 5.1). Any connection, even the case of exceptions, is tenuous however as there is significant variation across specimen length (y) and $\delta^{15}N$ values, to the extent that these characteristics should be deemed largely unlinked. This is not necessarily in line with the suggestion of some studies that elemental nitrogen availability is a key aspect contributing to specific aspects of plant growth (i.e. seed/fruit) and therefore arable productivity, with elemental nitrogen feeding into larger plant biomass. As already indicated, however, this is not always the case with some studies indicating nitrogen inundation acts as a growth inhibitor generally or causes selective vegetation growth. In regard to the $\delta^{15}N$ ratios there is some degree of variation within the tested *Hordeum* sub-samples of CF *Hordeum*, Hulled *Hordeum* and Naked *Hordeum* (Figure 5.2). There appears to be dispersal across two groupings, although this is not significant enough to indicate differing growth conditions, Naked *Hordeum* in general does exhibit higher $\delta^{15}N$ values than Hulled *Hordeum*. This could simply be a natural differentiation across species in regard to elemental nitrogen uptake, the Naked *Hordeum* grain is marginally larger than the Hulled varietal when de-hulled and so might simply require more elemental nitrogen during the growth process. It should be noted that the cereal grains were tested in this case, which would be naturally higher in $\delta^{15}N$ value than other aspects of the plant. In the case of the Traprain Law *Hordeum* assemblage, the majority of $\delta^{15}N$ values exceed the 3‰ mark decided upon as a mark indicative of supplemented growth. This is considered with caution as the effect of supplements such as terrestrial herbivore manure in agricultural sediments is exaggerated in cereals with $\delta^{15}N$ values increased by up to 10‰. So, the Traprain Law *Hordeum* assemblage $\delta^{15}N$ ratios may be completely resultant of limited anthropogenic systems of manuring using materials with lower elemental nitrogen, such as mixed midden waste or animal manure or indeed may indicate minimal use of materials with higher elemental nitrogen such as seaweed. There is minimal variation in the Traprain Law *Hordeum* assemblage in regards to $\delta^{15}N$ values even when considering inter-context dynamics. All contexts appear to be within the same spectrum of $\delta^{15}N$ values, some contexts such as Context D105 (Sample 545) are simply more internally consistent. It is likely that throughout the main period of occupation at the Traprain Law summit site, systems of arable supplementation varied minimally, with elemental nitrogen levels remaining upon the boundary of anthropogenic supplementation with lower vs higher elemental nitrogen content materials. This is supported by the calculated standard deviation for $\delta^{15}N$ ratios in relation to *Hordeum*, which relative to the nature of the dataset, is considered a relatively low standard deviation (1.59). The *Triticum* assemblage analysed in relation to $\delta^{15}N$ ratios is less significant in size which will hamper interpretation to a degree as there are arguably not enough specimens to prove a trend. The $\delta^{15}N$ values within the *Triticum* sub-samples of CF *Triticum* and Emmer *Triticum* again demonstrate minimal variation (Figure 5.2). In comparison to the *Hordeum* assemblage values there is little differentiation, in general the *Hordeum* $\delta^{15}N$ value grouping is more dispersed than the *Triticum* $\delta^{15}N$ value grouping. In general, the *Triticum* assemblage exhibits lower $\delta^{15}N$ values <6‰ (excluding single Bread *Triticum* example) than the *Hordeum* specimens <8.5‰. This is further demonstrated by the assemblage averages where *Hordeum* (4.91‰ – N-25, SDS-1.59) is higher than *Triticum* (4.26‰ – N-12, SDS-1.49), though only marginally. This would seem to indicate an inconsistency across arable crops in regard to supplementation, an inconsistent growing environment potentially however still within the same growth contexts. The inconsistency is not strong enough to suggest that these specimens originate from different growth contexts and so if cereal importation is an aspect of the Traprain network, it is liable to represent consistent importation from the same satellite sites. Again, the single specimen of Bread *Triticum* exhibits some separation from the bulk of the *Triticum* assemblage and is more in line with the upper $\delta^{15}N$ value *Hordeum* levels. The $\delta^{15}N$ values for the *Triticum* assemblage largely exceed the 3‰-mark indicative of supplemented growth (Figure 5.2). This as with the *Hordeum* assemblage may be completely resultant of minimal anthropogenic intervention with low level supplementation in an area which is agriculturally inclined or represent significant anthropogenic systems of manuring using nitrogen efficient materials, whether these are of low or high elemental nitrogen content level. Variation of $\delta^{15}N$ ratios in the Traprain Law *Triticum* specimens is equally unaffected by examination of context. This overall lack of variation is consistent with the calculated standard deviation for the Traprain Law *Triticum* assemblage, which considering the nature of the dataset is a relatively low standard deviation (1.49). In regard to $\delta^{15}N$ ratios the associated growth conditions at Traprain Law are consistent with either basic regulated anthropogenic supplementation with materials with lower elemental nitrogen (i.e. livestock or midden waste) or a sophisticated system of application for imported materials with higher elemental nitrogen (i.e. seaweed). There is some evidence to suggest that the Traprain Law cereal assemblage was highly controlled during its growth stages, it seems that the natural conditions were considered insufficient for high yield arable production, likely due to localised sediments being inefficient nitrogen catchments. A number of sites within the Traprain Law environs demonstrate potential for seaweed supplementation of arable crops, this would classify as a material with higher elemental nitrogen, there is potential evidence that this extended to the crop assemblage at Traprain Law. This is by no means a certainty however as although $\delta^{15}N$ values for the Traprain Law cereal assemblage may be considered medium to high, these are still within the threshold for supplementation with materials with lower elemental nitrogen (Figure 5.3). As already noted, $\delta^{15}N$ values effected through materials such as livestock waste can exhibit in cereal grain specimens at up to 10‰, which is well within the boundaries of the Traprain Law dataset. Ultimately, the suggestion is that the Traprain Law community and environs amended the naturally occurring elemental nitrogen levels in sediments surrounding the site, if indeed the cereals are locally produced, by using materials with lower elemental nitrogen concentration regularly and potentially when necessary imported materials with higher elemental nitrogen.

5.2.2.3. Nitrogen Analysis - Charcoal
(Table 5.2)

The entirety of the Traprain Law $\delta^{15}N$-tested charcoal assemblage is sourced from an extensive single context (3127), this is a stratigraphical layer of the Pond/Tank feature which may be either a ritual deposit or either intentionally placed or eroded displaced midden deposits. In any case, there is no obvious trend related to the specifics of the context in relation to the $\delta^{15}N$ (‰) values. In fact, this is probably directly reflective of the nature of the context as probably resultant of multiple deposition events. What can be stated is that the $\delta^{15}N$ values of Context 3127 are varied enough to reflect the morphology of a secondary woodland, with an arboreal diversity competing for elemental nitrogen uptake (Figure 5.4). Although no investigations have been undertaken to ascertain if $\delta^{15}N$ value profiles for secondary woodland are necessarily more diverse than those of primary woodland or indeed those which are anthropogenically managed, this may be an interesting aspect for further investigation. As with $\Delta^{13}C$, $\delta^{15}N$ ratios are directly affected by the process of combustion, usually relating to an overall decrease of original content. This is because in relation to most of the element constituents of a material, carbonisation has a reducing and oxidising effect. Thus, it is highly probable that the natural $\delta^{15}N$ ratio of a specimen is not preserved post-carbonisation, although the extent of this effect also requires further study. Theoretically decrease upon combustion is not a universal condition, as differing levels or types of chemical compounds could cause an overall increase, it is all dependent on the break-down of original chemical constituents within a specimen which is highly unpredictable. Currently there is no way to account for this effect. The suggestion may be made that $\delta^{15}N$ values are reflective of the extent of time stored post-harvest but pre-burn. This is because elemental nitrogen compounds do deteriorate over time, although relatively slowly, thus a stored wood resource may have a lower $\delta^{15}N$ value than a resource collected recently in a live state. There is no comparative dataset with which to analyse this potential effect. There is no clear link between the preservation notation allotted to each specimen and $\delta^{15}N$ values recorded, specimens compared in this regard do however demonstrate greater diversity potentially due to associated levels of contamination or preservation condition extending to the chemical damage caused in combustion. The conditions of initial preservation i.e. carbonisation have an obvious effect on the $\delta^{15}N$ value, this is unavoidable as fire-induced preservation has a significant chemical effect. It should be noted that P5 and P6 specimens were not included in the isotopic analysis of the site, it is probable that these would have exhibited an even more diverse data spread completely based upon preservation effect and having little connection to original $\delta^{15}N$ values. It should be noted that arboreal species have the ability to fractionate nutrients and in doing so direct aspects such as elemental nitrogen to aspects of plant anatomy which require more supplementation. As such these secondary branch specimens from Traprain Law are not indicative necessarily of the $\delta^{15}N$ values of the entire plant specimen, particularly as secondary branches are not necessarily, season dependent, high priority in terms of elemental nitrogen redistribution. The *Quercus sp.* sub-sample for the Traprain Law charcoal dataset demonstrates relatively minimal internal variation which is on the whole not significant enough to suggest disparate growth conditions for multiple plant specimens. There is also no indication that *Quercus sp.* specimens experienced a significant increase or decrease in $\delta^{15}N$ value, there is sufficient access to elemental nitrogen that growth is unimpeded although distinctly there is little to suggest optimum growth conditions either. The $\delta^{15}N$ values in the case of *Quercus sp.* may be relatively low as this a slow growing hardwood species, as elemental nitrogen levels are a main factor in growth it is logical that these would be comparatively minimal, although this requires further investigation. The range is not significant, with a lower figure of 4.91‰ extending to 6.64‰, these could even represent material collected from the same specimen plant. Whatever the case these are certainly from the same growth conditions. The calculated standard deviation in this case supports minimal variability, when related to the nature of the dataset, with a low standard deviation (0.56). The *Maloideae sp.* sub-sample for the Traprain Law charcoal dataset demonstrates only slight internal variation, the data is still not disparate enough to suggest drastically varied growth conditions for multiple plant specimens. There is no indication that this variation within the *Maloideae sp.* sub-sample extends to a significant increase or decrease in $\delta^{15}N$, whilst $\delta^{15}N$ values are significant enough to suggest average growth this again does not prove optimum conditions. As a significant fruiting species $\delta^{15}N$ values might be expected to be slightly higher, although this may not be expressed within $\delta^{15}N$ values in a secondary branch and is season dependent. However as with *Quercus sp.*, *Maloideae sp.* are relatively slow growing hardwoods, as such $\delta^{15}N$ ratios may be lower as more is not required to exacerbate growth. This is another aspect which requires further investigation so that species may be profiled in more detail. The range of *Maloideae sp.* is not particularly great extending from 5.89‰ to 7.15‰, interestingly the lowest value (5.89‰) is in relation to a significant $\Delta^{13}C$ outlier (Figure 5.6). This material may represent material collected from the same specimen plant, in any case, these are certainly from the same growth conditions. It is likely that the *Quercus sp.* and *Maloideae sp.* are from similar if not the same secondary woodland. The calculated standard deviation in this case supports minimal variability, when related to the nature of the dataset, with a low standard deviation (0.45). The *Salix sp.* sub-sample for the Traprain Law charcoal dataset demonstrates only slightly more significant internal variation, with the notable exception of a single outlier datapoint (8.61‰), the data is not disparate enough to suggest growth in differing conditions (Figure 5.6). The exception is the outlier datapoint (8.61‰) this has a high $\delta^{15}N$ value, which suggests that this specimen is probably from a different plant in a growth context which had more access to elemental nitrogen reserves. With this exception there is no indication that *Salix sp.* specimens noted a significant increase or decrease of $\delta^{15}N$ ratios during the growth process, there was sufficient access to elemental nitrogen to allow average growth this does not however necessarily indicate conditions for optimum growth. The $\delta^{15}N$ values for *Salix sp.* might be expected to be on average higher than *Quercus sp.* and *Maloideae sp.* specimens of a similar age and size, as *Salix sp.* is a typically fast-growing plant. This accelerated process of growth would require greater reserves of elemental nitrogen, constantly passing through the vascular system. The range is only slightly more significant, with a lower figure of 5.63‰ and an upper figure (excluding the outlier) of 6.71‰, these could represent materials from the same specimen plant. The greater range in this case could also be resultant of the fast-growing nature of *Salix sp.* as multiple growth rates might be exhibited in the same plant specimen, with more variation possible in faster growth. With the exception of the outlier these specimens are probably from the same growth conditions. The calculated standard deviation in this case supports minimal variability, when related to the nature of the dataset and the outlier is excluded, with a low standard deviation (0.36). The *Corylus avellana* sub-sample for the Traprain Law charcoal dataset demonstrates more significant internal variation, which may be significant enough to suggest marginally disparate growth conditions for multiple plant specimens. There is no indication that the *Corylus avellana* specimens experienced a significant increase or decrease in $\delta^{15}N$ ratios, sufficient access to elemental nitrogen for average growth is implied although again this does not necessarily mean growth conditions were optimum. Many of the *Corylus avellana* datapoints are consistent with *Salix sp.*, *Quercus sp.* and *Maloideae sp.*, as with the *Salix sp.* this might be expected to be higher. *Corylus avellana* is a fast-growing species, this accelerated growth would require greater reserves of elemental nitrogen. Again, this status as a fast-growing species may be responsible for the increased variation in the *Corylus avellana* dataset as multiple growth rates would be possible within the same specimen, greater variation caused by faster growth of multiple secondary branches. There may be multiple slightly different growth conditions within this sample, or the same growth conditions and multiple growth rates. This is supported by the wider range of the dataset, with a lower figure of 5.13‰ and an upper figure of 7.28‰. The calculated standard deviation in this case supports slightly more variability, when related to the nature of the dataset, with a still low standard deviation (0.68). The *Alnus sp.* sub-sample for the Traprain Law charcoal dataset demonstrates minimal internal variation, certainly not significant enough to suggest disparate growth conditions for multiple plant specimens. There is also no indication as with all other sub-samples thus far discussed for a significant increase or decrease in $\delta^{15}N$ values, sufficient access to nitrogen for average growth is implied. As with *Quercus sp.* and *Maloideae sp.*, *Alnus sp.* is a relatively slow growing hardwood species as such the $\delta^{15}N$ values for specimens of similar size and age would be expected to be comparatively minimal. The similarity in growth conditions might be used to suggest peripheral woodland, as *Alnus sp.* tends to prefer greater levels of saturation and nutrient deficiency, as with *Betula sp.* to some extent. In fact, the *Alnus sp.* specimens in this case may be reflective of a high $\delta^{15}N$ (‰) values as the species is not necessarily inclined to the same figure bracket as *Quercus sp.*, *Maloideae sp.*, *Salix sp.* and *Corylus avellana* (Figure 5.6). In this case, the profile fits mixed secondary woodland whereby all the aforementioned species are growing within the same space or areas which have exceedingly similar growth conditions. The range of the dataset in this case is not significant, with a lower figure of 5.58‰ and an upper figure of 7.15‰, these could represent material collected from the same plant specimen. The calculated standard deviation in this case supports minimal variability, when related to the nature of the dataset, with a low standard deviation of (0.51). Finally, the *Betula sp.* sub-sample in this case is perhaps the most interesting, there is minimal internal variation, with the notable exception of a single outlier datapoint (4.61‰) (Figure 5.6). On the whole otherwise variation is not significant enough to suggest disparate growth conditions for multiple plant specimens. The outlier datapoint is in high probability a specimen from a different set of growth conditions. However, it is actually the concentration of *Betula sp.* datapoints which is interesting, as *Betula sp.* prefers conditions reflected by low $\delta^{15}N$ values. The datapoint concentration indicates that the Traprain Law *Betula sp.* largely experienced high $\delta^{15}N$ values, this may indicate that this species is proliferating the same growth environment as all the other sub-samples, a secondary woodland with peripheral characteristics. The *Betula sp.* prefers low nutrient shallow soils, in this instance the main Traprain Law site would be suitable for *Betula sp.* growth. The main concentration of datapoints may also reflect that all the *Betula sp.* specimens are sourced from a different place, as they are at the upper bracket of the main data accumulation. The range is not significant when the outlier (4.61‰) is excluded, with a lower figure of 6.33‰ and an upper figure of 7.07‰, this material could feasibly be from the same specimen plant. The main data accumulation is certainly from the same growth conditions. This is supported by the calculated standard deviation, when related to the nature of the dataset and excluding the outlier, with a low standard deviation (0.32). Feasibly the Traprain Law $\delta^{15}N$ value charcoal assemblage could originate from the same area of secondary woodland, with the exception perhaps of the *Betula sp.* sub-sample. The wood resources within the Traprain Law environs are potentially all sourced from small pockets of maintained secondary woodland, with the area not naturally inclined to arboreal growth due to light nutrient-deficient sediments which do not easily retain water, opening potential for nutrient leaching.

5.2.3. Isotopic Data - Cereals - Comparatives

(Figure 5.7)

It is only recently that isotopic analysis has been tentatively applied to crop species as a new tool in the scope of archaeobotanical research, this development has been an integral step towards furthering understanding of archaeological arable agricultural systems. It allows investigation into the nuances of these systems and the extent of anthropogenic control of environmental dynamics to optimise arable agriculture, aspects such as systems of irrigation and sediment supplementation i.e. manuring or biofertilisation. As this is a recent technique development, there are minimal new analyses currently available for comparison. Currently datasets exist for a few Prehistoric sites in Britain (Bogaard et al: 2013) (Lightfoot & Stevens: 2012), although none are currently focused on Iron Age Scotland, and only a single example exists for the Roman period in Britain (Lodwick et al: 2021). Stanwick is a site situated in the Nene Valley in the East Midlands, the settlement was focused here from the Mid-Iron Age onwards to a highly Romanised villa complex (Lodwick et al: 2021). Although geographically distant from the site of Traprain Law, the two sites are surprisingly comparable due to the nature of the growth conditions in both local regions, both demonstrate light balanced loam sediments in a temperate sheltered climate, with both areas frequently described as fertile (Figure 2.3). Although the sediments surrounding Stanwick are more calcareous. The *Hordeum* $\Delta^{13}C$ (‰) values for Stanwick, whether Iron Age or Roman period, are directly comparable to the Traprain Law cereal $\Delta^{13}C$ dataset, as both indicate significant long-term water stress. As with the Traprain Law $\Delta^{13}C$ values, the Stanwick *Hordeum* $\Delta^{13}C$ values fit the 'poorly watered' and 'moderately watered' parameters as defined by Wallace et al (2013) (Figure 5.7). This would suggest similar systems of arable agriculture in regard to water management were present at both sites, both reliant on naturally occurring water supplementation of arable crops i.e. rainfall. The sediments which so often enable site descriptors of 'fertile' in regard to both sites in fact cause the issue of water stress for arable crops, as these light loam-type sediments have poor water retainment. It should be noted that this sediment quality would necessitate constant outwash of water, diffusion through the sediments, which in turn would cause some degree of nutrient leaching and a subsequent decline in sediment arable viability. In contrast the *Triticum* $\Delta^{13}C$ (‰) values for the Stanwick site are marginally higher than those of Traprain Law, the majority indicating only minimal water stress and categorised according to Wallace et al (2013) as 'moderately watered' (Figure 5.7). This may indicate that the Stanwick *Triticum* dataset had greater priority as an arable crop than that at Traprain Law, this may have extended to anthropogenic application of water to the crop but may also be a result of natural factors such as increased rainfall. There is significantly more variation in $\delta^{15}N$ ratios at Stanwick, a main point highlighted in the Lodwick et al (2021) analysis is the difference in Iron Age versus Roman $\delta^{15}N$ values. At Stanwick there is a clear decrease in $\delta^{15}N$ (‰) values in *Hordeum* from the Iron Age to the Roman period, this suggests that the community applied a lesser quantity of materials with higher elemental nitrogen to arable agricultural spaces to supplement crop growth (Figure 5.7). Quite apart from suggesting that this indicates arable agricultural decline, disinterest or disenfranchisement in the region, it has been noted that this could be a proxy for the intensity of arable cultivation. Implying that arable agricultural cultivation at Stanwick became more extensive in the Roman period, cereals produced through lower labour input per unit area (Van der Veen & O'Connor: 1998) (Lodwick et al: 2021). This is less evident with the Traprain Law assemblage the majority of which is Late Iron Age in date, although two diffused concentrations of $\delta^{15}N$ (‰) datapoints roughly align with either the Iron Age Stanwick *Hordeum* data trend or the Roman Stanwick *Hordeum* data trend. In any case the $\delta^{15}N$ values for the Stanwick site are high, suggesting levels of supplementation reflective of application of materials with lower elemental nitrogen and in some cases the potential for use of materials with higher elemental nitrogen as at Traprain Law (Figure 5.7). The same can be stated for the Stanwick *Triticum* $\delta^{15}N$ (‰) values, although these are marginally higher than the Traprain Law *Triticum* $\delta^{15}N$ (‰) values on average, they are still noticeably within the same data collective. The site of Danebury is also comparative, although the dataset in this case is minimal, this is the largest hillfort in southern Britain. In this sense, regarding site nature and purpose, Danebury is perhaps uniquely comparable to Traprain Law within the boundaries set by currently available data. There has been some suggestion that at Danebury, comparatively no evidence suggests this occurred at the Traprain Law summit, the processing, storage and redistribution of grain was organised (Cunliffe: 1984) (Hill: 1996) (Lightfoot & Stevens: 2012). Danebury is dated to 550 BC to 50 AD, with the data relevant to this discussion originating from Phase 3 (470-360 BC) and Phase 7 (270-50 BC). As with Stanwick and opposed to Traprain Law, Danebury is situated within a landscape of largely calcareous sediments. The site remains a positive comparison to Traprain Law however as light sediment, typically 200-300mm thick overlays the chalk bedrock. These light sediments have a significant impact throughout all three sites, as all were/are frequently judged to be preferred landscapes for settlement and arable taskscapes. This is because the light sediments and gradual slopes of all regions would have been easily ploughed using prehistoric ard technologies (Lightfoot & Stevens: 2012) (Figure 2.1, 2.3). Danebury was judged to have five ecological zones, the two of these judged suitable for arable agriculture, flood plains and dry downland, are both evident also at Stanwick and in terms of comparative landscape typologies within the environs of Traprain Law. The $\delta^{15}N$ and $\delta^{13}C$ values in this case were used to indicate that the specimens were not harvested from the same growth conditions and therefore not from the same plot, instead multiple collections in a single production season from multiple locations (Lightfoot & Stevens: 2012). This was an important supporting aspect for the argument that arable resources from surrounding environs were pooled within the hillfort (Jones: 1984). This is a fundamentally different role than what is currently suggested for Traprain Law by its extant dataset, as there have been no significant storage contexts currently located on the Traprain Law summit and arable residues recovered are relatively minimal. The Danebury $\Delta^{13}C$ (‰) values for the *Hordeum* dataset largely indicate significant water stress, with the majority of datapoints aligning with the Wallace et al (2013) categories of 'poorly watered' and 'moderately watered' (Figure 5.7). This aligns with the Traprain Law *Hordeum* $\Delta^{13}C$ (‰) values, and those of Stanwick, suggesting that the factor of light sediments which have minimal water retainment is truly an impactful factor on an agricultural system, one which in the Iron Age was not amended at a cultivation level. This may even have been a systemic issue, although further comparative datasets would be required to affirm this. The Danebury *Triticum* $\Delta^{13}C$ (‰) values also align with this trend, the majority representing in the categories of 'poorly watered' and 'moderately watered' and indicating some degree of water stress (Figure 5.7). This is the same as indicated within the Stanwick and Traprain Law datasets. Interestingly the variation within the Danebury $\Delta^{13}C$ and $\delta^{15}N$ values, regardless of species group, is much greater than that at Stanwick and indeed at Traprain Law. Certainly, this supports the concept that Danebury acted as a centralised collection and redistribution point for arable resources from environs sites, either to further trade beyond the Danebury environ collective or to exert control through food resource ownership on local community systems. The lack of this variation trend at Stanwick is potentially problematic as this is a high-status hillfort site and seems to have had only internalised responsibility for resource control. This may be a result of the nature of the sampled contexts, however. Traprain Law, also does not necessarily exhibit this trend, which would either suggest that subsistence resource control was not a responsibility of the summit community, this is thus a different form of hillfort, or simply the evidential basis is as yet undiscovered that would reveal this site purpose. Alternatively, this is an aspect of the purpose of the Traprain Law community, and the localised environmental growth conditions are not distinct enough to cause significant variation in $\Delta^{13}C$ and $\delta^{15}N$ values. The Danebury $\delta^{15}N$ *Hordeum* (‰) values suggest that the majority of the dataset was not exposed to anthropogenic systems of sediment-nutrient amendment, as the values are on the whole low. The same can be stated to an even more extreme degree for the Danebury *Triticum* $\delta^{15}N$ evaluated dataset, there is in fact evidence for elemental nitrogen deficiency within sediments (Figure 5.7). As with the Roman period data at Stanwick this could suggest an extremely intensive arable agricultural system present across an extensive landscape of Danebury associated environs. On the other hand, it could simply indicate a lack of materials with higher elemental nitrogen for sediment supplementation in the region. Traprain Law is in regard to the isotopic analysis of cereals a step in the right direction, though more investigation certainly needs to be done in this regard and more datasets need to undergo this form of analysis. The site of Traprain Law does share similarities with the sites of Stanwick and Danebury but is still different in the nature of the site assemblage, this is currently a hillfort site with no evidential basis for the control of arable agricultural product in the region, and with a collective of environs which in terms of isotopic variation may not be distinct.

6. <u>TRAPRAIN LAW INVESTIGATION - NEW DATASET – DISCUSSION</u>

6.1. Traprain Law - New Dataset - Discussion - Introduction

This section focuses on discussion of research questions related directly to the new Traprain Law data previously described in the preceding results section. The first of these pertains to the nature and extent of subsistence and agricultural practice in relation to the main Traprain Law summit community. The data in general appears to indicate arable agriculture dominated by primarily *Hordeum* with lesser growth of emmer *Triticum*, the production of this appears to have been the prerogative of environs sites with processing residues minimal at Traprain Law. The second research question considers the nature of the main Traprain Law community fuel profile and relates this to community-environment interactions. The assemblage is dominated by *Corylus avellana*, *Alnus sp.* and *Betula sp.* all of which fit a secondary woodland environmental profile and are particularly responsive to management and resource optimization processes such as coppicing. The third research question in this case concerns the distinguishment of the nature of contexts and assemblages at the Traprain Law summit site, focused particularly on the nature or purpose of depositions. A particular focus in regard to this is the 'Pond/Tank' feature which it has been suggested has a ritual aspect, in this regard many of the associated deposits are more in keeping with midden characteristics. The 'Pond/Tank' depositions are not significantly different from those recovered elsewhere on the summit site, ritual depositions would likely be more high-status or targeted rather than general waste products. The fourth research question focuses on the Traprain Law environmental context and the dynamics of its vegetation communities across time. The evidential focus of this was the palynological assemblage which demonstrates that Traprain Law throughout certainly later Prehistory existed in an open landscape consistent with arable fields, pasture, meadow, wasteland and disturbed ground. The nature of this section with its focus on the new Traprain Law data means there is reduced associated key literature, with the exception of that directly regarding the 1999/2000 excavation and some reports/notes of an antiquarian nature focused on the early Traprain Law excavations. These include the 'Traprain Law Summit Project, East Lothian' Data Structure Report 1999 (Armit et al: 1999) and the 'Traprain Law Summit Project, East Lothian' Data Structure Report 2000 (Armit et al: 2000), and other unpublished excavation documentation and fragmentary resources. The entire new Traprain Law dataset itself is limited, many of the issues presented by individual aspects of the assemblage have been predefined but on the whole the assemblage is limited by its size. The number of contexts examined which constitute new plant-based data are limited to <20, and whilst this is a significant contribution to an extremely limited pre-existing assemblage it means that there is a lesser degree of certainty in analysis. This is further limited by general issues of preservation in regard to the Traprain Law assemblage, much data has not been preserved in the archaeological record as a result of sub-standard preservation conditions for organics, and the aspects of the assemblage that are preserved are morphologically damaged hindering identification. As a result of this the plant-focused assessment of the Traprain Law summit site is largely dependent on a single feature, the 'Pond/Tank' feature, and <6 contexts. Still, the new Traprain Law dataset has opened discussion and developed possible answers to many questions regarding the interactions between the Traprain Law settlement and vegetation communities and explored the reliance of the settlement on plant-based resources. With this contribution there exists a more complete image of the placement of the Traprain Law summit site and associated community within its environment.

6.2. Traprain Law - New Dataset - Discussion - Research Question 1

What is the nature and extent of subsistence and agricultural practice for the Traprain Law community?

The nature of recoverable data suggests that the central concern of the Traprain Law agricultural system was cereal production, which is in accord with the general later prehistoric dietary profile. The extent to which cereal production dominates the Traprain Law agricultural system is improbable however, of course this may be a result of the narrowness of recovered archaeological data, many arable species and wild varietals do not typically preserve well within the archaeological record. Whilst animal bone was recovered from the main Traprain Law summit site, conditions for preservation were not optimum and significant aspects of the assemblage probably did not preserve, the animal bone assemblage is not analysed here. The likelihood is that whatever the extent or quality of the recovered assemblage, in reality the image of Traprain Law associated agricultural practice would have been more diverse. The centrality of cereal production in the Traprain Law agricultural system however is indisputable, and the dominant aspect of this was *Hordeum sp.*, a staple across later prehistoric Scottish sites. As a group *Hordeum sp.* are a highly resilient crop, capable of relative productivity in varied marginal environments, because of this the group is the most significant cereal crop in Scotland and has held this status since prehistory. Earlier contexts are often dominated by hulled *Hordeum sp.* varietals, as is the case for Traprain Law where preservation identifiers allowed. Still there are some instances of naked *Hordeum sp.* varietals which are commonly associated with slightly later prehistoric communities. The ubiquity of *Hordeum sp.* across the Traprain Law site is certainly due to the natural characteristics of the plant, of hardiness, tolerance of the full spectrum of soil conditions and sediment types. This would suggest that agricultural practice at Traprain Law focused on reliable productivity, the subsistence of the community depended on the main crop and so a hardy consistent varietal was the priority for agriculture. The productivity of this 'safe' species was optimised, along with the rest of the system as much as possible, in regard to *Hordeum sp.* one significant possibility for achieving this is fertilisation of the production zone, through deposition of nitrogen compounds in waste materials. This was the case at Traprain Law where the entire cereal assemblage indicates application during growth of low-nitrogen compound materials such as manure or midden waste. With potential for application in some cases of high-nitrogen materials as biofertilizer i.e. seaweed. The implication is that low-nitrogen compound materials were applied as the natural growth conditions surrounding Traprain Law were not optimal, despite the apparent natural proclivity for arable agriculture in the region due to a relatively mild climate and easily ard-ploughed sediments. Despite regional proximity to the coastline, seaweed, a common high-nitrogen compound material was not applied commonly within the Traprain Law agricultural system, the potential is there for this to have been an informed choice as over supplementation with nitrogen can damage productivity. It can result in this via several courses, it can encourage 'green' growth i.e. leaves to the detriment of grain, it can encourage growth in the 'pest' population within sediments which in turn negatively impact plant germination or survival rates, lastly it may have no clear discernible impact beyond that displayed by low-nitrogen compound materials, meaning the extra effort to collect a more specialist resource is irrelevant. The carbon isotopic analysis of the cereal assemblage presented no proof of artificial irrigation systems, and archaeologically no evidence exists to suggest environs presence of these features, despite evidence of significant water stress within the dataset. This calls into question the sophistication of the Traprain Law agricultural system as with high levels of water stress the potential exists for high levels of crop loss prior to harvest, perhaps an irrigation system was beyond the means of the Traprain Law environs or perhaps the negatives of water stress did not visually manifest within the crop to the extent that it would be seen as anything more than a natural loss. The Iron Age period contexts at the Traprain Law site are dominated by *Hordeum sp.* but in the later Iron Age also appear to contain various *Triticum sp.* varietals including mainly Emmer *Triticum* and some small quantity of the less hardy Bread *Triticum*, both increase in presence in Roman period contexts. Emmer *Triticum* is particularly acknowledged as being a significant aspect of the Roman military diet, the presence at Traprain Law perhaps indicates the depths of Native-Roman interactions. The increasing presence of Emmer *Triticum* within the Traprain Law agricultural system may in part respect the influence of Roman tradition, however it should also be noted that *Triticum sp.* are superior to most other 'native' cereal varietals in regard to nutritive quality. To a community which had previously survived on largely *Hordeum sp.* which although hardy is less nutritionally valuable, a choice to include *Triticum sp.* within growth plans would be ultimately beneficial, at Traprain Law the focus remained on reliable *Hordeum sp.* crops but was supplemented by *Triticum sp.* as a secondary crop. The Traprain Law assemblage also includes a few *Avena sp.* specimens, although this group is mostly associated with the Roman period and later Early Medieval stratigraphies in regard to domesticated species, wild varietals do occur in earlier contexts. It is probable that in regard to the Traprain Law assemblage these are incidental 'wild' inclusions, growing within the main cereal *Hordeum sp.* crop at the point of harvest. The contexts from which these specimens originate are broadly Iron Age in association and deposits are not significant enough to suggest intentional cultivation. The direct involvement of the Traprain Law community with cultivation is questionable, the 'weed' assemblage is minimal, and the cereal-type processing residues recovered are not only limited but may be associated with wild cultivars as most are indeterminate. Based on this it is possible to suggest that cereals were imported in a pre-processed state, on some level, the most likely responsible parties for this supply chain are environs sites with the main Traprain Law summit community acting in a supervisory role. In this respect the Traprain Law associated agricultural system was reliant upon potentially satellite sites curated specifically for environment management for the purposes of high production agriculture. As a categorized hillfort Traprain Law may not have been a site of permanent occupation, in this regard it would not have required a year-round agricultural system to supply sustenance or indeed a large on-site storage context, a feature which is yet to be identified. It is entirely probable that the main Traprain Law site was not a permanent community, and when in residence as a high-status community it supervised agricultural practices within the environs and sourced the products necessary for its subsistence from this system. Overall, there is minimal direct evidence as to subsistence or 'wild harvest' associated species at Traprain Law, even the usually ubiquitous hazelnut has limited presence enough perhaps to suggest occasional dietary supplementation. There are a few species within the 'weed' assemblage which are suitable for subsistence, but as is more probable in seed form, these could also be cereal-processing residue. These include *Brassica*/*Sinapis* (Cabbage/Mustard), *Chenopodium album* (Fat-Hen), *Chenopodium*/*Atriplex* (Goosefoot/Orache) and less specifically a number of indeterminate seed/fruit specimens. Some of the aforementioned are suitable grain substitutes but are not viewed positively in comparison particularly in regard to palatability or nutritional value. The vegetation of a number of these species is more often consumed, so that all that can be stated in this case is the potential for dietary supplementation via 'weeds' as the surviving form of the species is the seeds. Similarly, a number of potential subsistence or 'wild harvest' associated species are indicated within the palynological profile of the Traprain Law site these include *Rosaceae sp.*, *Urtica sp.*, *Ligusticum scoticum*, *Myrrhis odorata*, *Apiaceae sp.*, *Sinapis sp.*, *Brassicaceae*, *Chenopodiaceae*, *Cichorium intybus*, *Fabaceae*, *Corylus avellana*, *Quercus sp.*, *Empetrum* and *Vaccinium*. Many of these were present only in traces so a large population of subsistence orientated plant species cannot be inferred, some of the aforementioned are considered to be more palatable than others, the fruiting species *Empetrum* and *Vaccinium* for example would be more edible subsistence products. It should be noted however that it is not useful to apply modern taste profiles and opinion to archaeological contexts. The sum of what can be stated in regard to Traprain Law subsistence practice is that it probably occurred, suitable species are present within the environs to facilitate the supplementation of a primarily cereal-orientated system. Collection of 'wild' subsistence resources for the Traprain Law community was not a system priority, it is liable that a factor in this was the temporary high-status nature of the community, as a number of the environs sites demonstrate more evidence of engagement with wild resources. In conclusion, the subsistence and agricultural practices associated with the main Traprain Law summit site were probably distant in terms of practical involvement from the resident community, there is minimal evidence to suggest that the community itself occupied any more than a supervisory position in the taskscape. The agricultural system instated in the environs was cereal focused specifically *Hordeum sp.* focused, which in turn suggests that the quality required in a primary crop was its reliability. This despite the relative conditions of the region in terms of climate, precipitation and sediment quality (to some extent) naturally inclining the environs to high agricultural productivity. The agricultural system itself does not appear to have been significantly high maintenance as no evidential basis exists for irrigation features or sustained imported high-nitrogen material supplementation of sediments. A systematic choice is evident of low-nitrogen compound materials (animal manure, midden materials) on the whole over high-nitrogen compound materials (seaweed) in regard to manuring, despite these supposedly superior resources being available. This could indicate manipulation of the natural sediment state of the environs and a decision to prioritize time for more needed resources, productivity would not necessarily have been greatly impacted by application of high-nitrogen compound materials (seaweed) versus low-nitrogen animal waste products. In the end this assessment will have to remain provisionary, this is what the evidential foundation recovered from Traprain Law so far indicates, yet Traprain Law is becoming notorious for its extended excavation history with the site investigation remaining incomplete. There are certainly resources still present within the unrecorded stratigraphies of the Traprain Law summit site which may disagree with this assessment.

6.3. Traprain Law - New Dataset - Discussion - Research Question 2

What is the nature of the Traprain Law community fuel profile and what does this suggest about community-environment interactions?

The Traprain Law fuel profile seems to be ultimately dependent on wood as a hearth material, this is in accord with many prehistoric sites within the wider region, the point of difference is the exclusivity of the Traprain Law assemblage which neglects entirely other fuel concordant materials based upon the currently available dataset. Even within the Traprain Law environs sites there is greater diversity in fuel profile with some evidence of 'turves', peat and coal-type materials, the fact that this trend is parallel temporally to the exclusive Traprain Law assemblage might suggest that the needs of the Traprain Law community were paramount and it held resource priority. All the various fuel materials have positive and negative qualities, peat for example can burn reliably for long periods however it does emit during ignition significant smoke and by-products, it is also not a common resource surrounding the main Traprain Law site, coal as an accessible fuel resource is even less common. Wood as a fuel material is renewable when resources are managed in an environment, dependent on species there is potential for efficient ignition and extended burn periods, most species are also relatively free from negative by-products. In terms of accessibility wood resources are the most logical fuel choice for Traprain Law although evidence suggests that clearance trends made woodland a secondary concern and thus wood resources slightly less common. The pollen data extracted from the 'Pond/Tank' feature for Traprain Law indicates that arboreal pollen became less common in comparison to *Poaceae sp.* progressing from Zone 1 (Bronze/Iron Age) to Zone 3 (late Iron Age - Roman Period), this is probably resultant of organised communal clearance practices for the purpose of expanding agricultural potential. The species with more defined presence throughout the pollen trends indicate a predominantly secondary woodland profile, these include *Alnus sp.* and *Corylus sp.* both of which see significant decline during the Zone 1 expansion and clearance trend, *Betula pubescens* and *Pinus sp.* (diploxylon) the only species to demonstrate a Zone 3 increase in presence (Figure

4.3). At Traprain Law woodland was secondary in terms of environment-resource importance to curated agriculturally viable land, initially this would suggest confidence in availability of fuel resources. Perhaps an area of secondary woodland was purposefully preserved and managed as this would have been to the ultimate benefit of the Traprain Law community. This is supported by the homogenous nature of the charcoal isotope data the majority of which suggests, with the potential exception of *Betula sp.*, that a similar growth environment in terms of water and sediment nutrient content applies to all analysed species. There is some limited evidence for targeted management aspects in relation to wood-based resources, the ring-counts of the charcoal assemblage throughout the Traprain Law site contexts are low ranging from 2 to 9 with an average of 4.57 (N-51, SDS-1.75) in terms of commonality. These consistently low ring-counts align with collection of deadfall or collection of coppiced specimens, such narrow diameters would have minimal usage for purposes other than fuel. The potential for coppicing management is further supported by the high presence of *Corylus avellana* throughout the charcoal assemblage as this is a species most commonly associated with coppicing and the practice would further maximize the resource. The ring-counts are consistent with coppice rotation for the dominant assemblage species, for example *Betula sp.* typically are collected at 3-4 years and *Corylus avellana* at 3-6 years. The only exception to this trend is the *Quercus sp.* dominance in the site charcoal assemblage secondary only to *Corylus avellana* and *Betula sp.*, coppicing of *Quercus sp.* is less typical although not without precedence, the group can have up to a 50-year rotation. It is perhaps unsurprising that the *Quercus sp.* rotation too is limited to a range from 2 to 9 years, if the Traprain Law community had no use for larger diameter timber and instead fuel resources were at a premium, harvest of coppiced specimens would be limited to early growth stages, this is simply pragmatic. It has previously been suggested that ring-count cut-off points such as that exhibited within the Traprain Law charcoal assemblage are at least evidence of selective harvesting and indicative of some form of environmental management. Evidence suggests that in regard to community-environment interaction Traprain Law did manage at least one area of secondary woodland sustainably via practices like coppicing which would also maximize potential fuel resource intake. Although it should be noted collection of ring-count data was severely limited due to variable preservation levels, the Context 3127 100 specimen sub-sample for example only exhibited a 51% success rate for ring-count identification. As a result of this any interpretation must be considered carefully and with some degree of flexibility, as further data collection may disagree with current trends. The pollen trends as already discussed support the presence of secondary woodland throughout however with an overall projection of decline, the exception to this is *Pinus sp.* (diploxylon) which demonstrates an increased presence in Zone 3. The issue with *Pinus sp.* pollen is that its morphological characteristics optimize it for air dispersal to such an extent that it can travel hundreds of miles and in fact represent as a contaminant to localised environmental records. In this case, however, *Pinus sp.* are not non-native to the area and demonstrate a sustained yet minimal presence throughout Zone 2 as well as the increase in Zone 3. If *Pinus sp.* are demonstrating an increased presence in the Traprain Law environs then this could indicate that the Traprain Law community are either proactively or passively preserving the resource for usage, as *Pinus sp.* are multi-use. The absence of *Pinus sp.* from the Traprain Law charcoal assemblage may be resultant of *Pinus sp.* prioritization for other purposes, it is for example more easily shaped/formed so could have been reserved for usage as a building material or for formation into utensils. Otherwise, the absence could be resultant of the quick ignition, high flammability and quick burn-time of the species group which means that it does not often preserve to a high standard in hearth contexts. In any case, the growth of *Pinus sp.* woodland during Zone 3 may have been positively encouraged by the Traprain Law community, if the species group is localised, as woodland growth in other capacities still exhibits negative trends comparable with clearance practices. The carbon isotopic analysis of the Traprain Law charcoal assemblage indicates that the wood fuel profile may have had a relatively high concentration of ^{13}C enriched volatile organic compounds prior to burning, as the $\Delta^{13}C$ values recorded are quite low. This suggests many aspects, primarily that in respect to conditions of growth specifically water availability there was neither significant inundation nor dearth, this may have something to do with environmental management but is more likely attributable to natural conditions as there is no clear evidential basis for practices like irrigation. What is more interesting in regard to this discussion section is that it could potentially indicate that Traprain Law wood resources were collected in a live state which is consistent with coppicing practices. A specimen collected in a live state is liable to have a higher initial concentration of ^{13}C enriched compounds which could lead to a greater potential depletion upon carbonisation and therefore a lower $\Delta^{13}C$ value than a specimen collected in a dry (dead) state which would already have begun natural depletion and would theoretically be more stable. Although this is just theory as there have currently been no studies focused on potentially identifying how the pre-burn chemical state of a wood specimen effects post-burn $\Delta^{13}C$ values. As this is an archaeological dataset this cannot be proven as pre-burn $\Delta^{13}C$ values are non-definable, however it may be stated that it is the case that live collection of the Traprain Law specimens is more probable as the $\Delta^{13}C$ values exhibited by the dataset are low. This does provide further commentary in support of coppicing practices being an aspect of the Traprain Law environmental management system. The nature the Traprain Law charcoal contexts and therefore the fuel profile is also clarified by the charcoal associated carbon isotopic data, the entirety of the recovered charcoal dataset $\Delta^{13}C$ values are consistent with being residues from a wood-fuelled hearth. The relatively low trend in $\Delta^{13}C$ values suggests that temperatures exceeding 475 °C were not reached in contexts, as due to greater breakdown potential of secondary products at higher temperatures $\Delta^{13}C$ values would be more variable. The charcoal assemblage is consistent with the average temperature range for wood-fuelled hearths, between 100°C and 475 °C, again supporting that the Traprain Law fuel profile consisted of wood resources and in turn suggesting that a significant motivator of secondary woodland management was fuel resource longevity. On the whole, the Traprain Law charcoal assemblage is diverse and consistent with an established secondary woodland model, the analysed samples are in general dominated by *Corylus avellana* or *Betula sp.* or even occasionally by *Quercus sp.*, next proportionally *Salix sp.* and *Alnus sp.* are common, this is often followed by lesser proportions of *Maloideae sp.*, *Pinus sp.*, *Fraxinus sp.*, *Ilex sp.*, *Ulmus sp.* and *Prunus sp.* Many of these species are suitable for coppicing and the majority fit the profile of fuel materials particularly those species present in larger proportions. There are some species groups however that are typically unsuited for inclusion as fuel and coppicing practices, for example *Maloideae sp.* which are not consistently fuel efficient and are typically more suited for other uses which necessitate preservation, many are edible fruiting species. In the case of those species' groups present within the assemblage at lesser proportions, it is more likely that these were collected as deadfall to supplement coppiced materials or for smaller temporary hearth features where a wood supply chain was not established, perhaps by groups of agricultural workers or visitors to the summit site. The suggestion is that the Traprain Law community monopolized local wood resources perhaps due to the high-status nature of the site, potentially exclusively using these in regard to wood-fuelled hearths. The fuel profile itself is indicative of an established secondary woodland dominated by species groups atypical of coppicing management, including *Betula sp.*, *Quercus sp.* and *Corylus avellana*. It seems clear that coppicing was practiced in regard to the Traprain Law fuel profile to maximize a secondary woodland resource which was deemed of lesser importance compared to clearance for agricultural system expansion. Whilst other species groups are indicated in the Traprain Law fuel profile these are proportionally minimal and could represent more temporary hearth contexts which could not engage with summit site coppiced resources or simply are incidental inclusions. The community-environment interactions at Traprain Law in regard to the fuel profile are focused on maximizing resource extraction from a declining secondary woodland, where a choice was made which prioritized agricultural potential.

6.4. Traprain Law - New Dataset - Discussion - Research Question 3

What can be ascertained about the nature of the 'Pond/Tank' feature contexts and assemblages at the Traprain Law summit sites, specifically the nature or purpose of deposition?

The feature which seems most pertinent to this research question and fundamentally central to this thesis is the 'Pond/Tank' feature, which has some degree of uncertainty surrounding it as to its nature and purpose in relation to the Traprain Law summit site (Figure 3.1). Typically, the 'Pond/Tank' feature is observable as a small hollow of marsh overlaying year-round saturated sediments, at periods of inundation this develops into a feature more like an atypical standing water pond. The feature when partially excavated by Cree (1923) was revealed to have undergone some degree of artificial modification, although it is not clear that the entire feature is man-made, it is more likely that it has been enhanced. This was also the first instance in which the purpose of the feature was acknowledged as potentially having ritual significance. If indeed the feature has been artificially amended, then it must have an associated purpose of some importance to the local Traprain Law community as otherwise this would constitute an unnecessary act. There is a broad demonstrable trend in Iron Age spaces of ritual significance, which is associated with markers in a landscape, typically high elevations with unobstructed visibility of the wider landscape and accumulations of water, saturated spaces. What is also clear is that Iron Age sites of ritual significance often exist in a landscape wide network connected by visibility, in this regard the Traprain Law summit does have potential as retaining a ritually significant site as many of the environs sites have ritual association. If the 'Pond/Tank' feature constitutes more of a built cistern or well construction due to anthropogenic interference, then this is a commonality the site shares with many other Scottish hillforts. It should also be noted that purpose or usage of the 'Pond/Tank' feature as a centre of ritual deposition would not exclude it from also having more utilitarian functions, although these also present problems as for example there is no clear indication that the 'Pond/Tank' feature was consistently inundated enough to constitute a water source. The Cree (1923) excavation recovered artefacts approximately 0.2-0.3m in depth amongst the waterlogged materials, these included a miscellaneous bronze object, coarse stone tools, a lignite whorl, a fragment of a mould potentially for a late Bronze Age sword and pottery fragments of Iron Age and late Medieval types. The 1999/2000 excavations also recovered a substantial artefact assemblage from the 'Pond/Tank' feature, artefacts were ubiquitous throughout the feature contexts (Figure 3.2). This assemblage included >90 fragments of prehistoric pottery, shale/cannel coal working debris, quartz flakes and a fragment of a shale/cannel coal finger ring. Whilst artefacts were abundant in regard to the 'Pond/Tank' feature, the assemblage is not immediately identifiable as constituting votive deposition, there is no trend in artefactual deposition with the exception of the commonality of prehistoric pottery sherds, similar could be attributed to a midden context. One of the richest samples, regarding plant macrofossil recovery, was Sample TT3 from Context 305 potentially this could support the case for the 'Pond/Tank' features ritual purpose, as it would be a more significant deposition. Otherwise, the plant macrofossils recovered from the 'Pond/Tank' contexts are insignificant in this regard, as ritual deposition of singular/small quantities of grain is unlikely, in these cases incidental deposition is probable. Whether this is direct or indirect is not knowable with any degree of certainty, however potential remains for erosion into the 'Pond/Tank' feature of nearby midden deposits as runoff. If the 'Pond/Tank' feature is a context of ritual deposition, then plant remains do not appear to have been a common item for offerings as the assemblage is minimal. A significant charcoal assemblage is also associated with the 'Pond/Tank' feature, exactly how these residues were deposited in a consistently waterlogged context is potentially complicated. The most significant context in the regard is Context 3127 (Sample 337) which constituted >600 specimens. All the charcoal recovered according to morphological characteristics and $\Delta^{13}C$ values is most consistent with an atypical wood-fuelled hearth burn. There is potential for these charcoal residues to have a ritual association if they are related to some form of cremation, whilst burnt bone was recovered from the 'Pond/Tank' feature the association of this with the charcoal assemblage is unclear, in any case the burnt bone is probably animal-type. Otherwise as with the plant macrofossil assemblage, this could be consistent with a waste deposition or run-off from a midden-type context. Ultimately the potential for the 'Pond/Tank' context having ritual significance rests almost entirely on the waterlogged nature of the feature and its placement on a high-status summit which dominates the landscape with optimum visibility. With the exception of bulk, the assemblage recovered from the 'Pond/Tank' context does not significantly differ, for both the artefact and ecofact groups, from that recovered from the wider site. This is not enough to exclude the possibility of ritual/votive deposition however, motivations for the selection of 'offerings' are more closely aligned to personal wealth or the availability of resources than on pre-determined prescribed selections (Hargrave: 2018). Archaeologically a strong indication of votive behaviours may be a statistically higher number of deposits as a case for repeated deposition events or even larger assemblages in comparison to other site areas (Hargrave: 2018). The entirety of the artefactual assemblage associated with the 'Pond/Tank' feature is fragmentary or damaged/broken, this again does not exclude the possibility of a ritual deposition site as a term which is often associated with Iron Age ritual contexts is 'ritual killing' which is a purposeful damaging of ritualized objects prior to deposition (Hargrave: 2018). Whilst this term is often applied to damaged artefacts in ritual contexts it is not always useful as miscellaneous materials and by-products such as scrap metal, pottery sherds (broken long prior to deposition), unprocessed metals, material working debris and 'waste' materials (i.e. bone, shell, plant macrofossils) are also frequently recovered from known ritual contexts. In conclusion, the depositions of the 'Pond/Tank' feature are so diverse compared to wider site contexts, that it seems likely that the feature held a specialised purpose which could be associated with ritual aspects. Considered singularly some aspects of the assemblage, in particular the plant macrofossil aspect, seem more probably associated with incidental inclusion, secondary deposition via erosion into the feature of a midden context. However, the association of individual means and resource availability with votive deposition again aligns this with ritualized practice, as size of individual depositions is not considered as much of a factor. The deposition of cereal grains in particular holds some significance in relation to Traprain Law as this site is situated in a landscape with high potential for agricultural productivity. The diversity of the assemblage related to the 'Pond/Tank' feature is likely as diverse as the Traprain Law summit community, with those interacting with the feature potentially in a ritual capacity making votive offerings uniquely associated with the individual. Despite the apparent diversity of the associated assemblage, it is missing any artefactual basis for high-status interactions. Despite the noted high-status nature of Traprain Law as a site within the context of the wider landscape, this is not necessarily clear within the 'Pond/Tank' deposits, perhaps individuals of this type interacted ritually in another capacity and are thus not associated with this feature. Equally some artefacts or particularly ecofacts are unattached to status labels, the cereal grain depositions associated with the feature for example could originate from any societal group, such specimens as these may even be more probably associated with higher status individuals who have disposable sustenance resources. The features stratigraphy does not necessarily appear associated with a significant time depth, this may be a result of the feature being employed in a ritual capacity only for a short period of time in comparison to the longevity of the wider site. Alternatively, there has been some suggestion that the Traprain Law summit community may have been largely seasonal in which case ritual depositions would be relatively isolated to periods of occupation which would present stratigraphically as a shortened period of use. The majority of the assemblage is attributable to later Prehistory in date which is coincident with the period during which ritual deposition in waterlogged contexts associated with higher elevations occurred most frequently. There are however some seemingly anomalous artefact depositions including medieval pottery sherds and 19th/20th century glass shards, these would not be aspects of ritual deposition and must be associated with incidental 'waste' depositions either directly into the 'Pond/Tank' feature or indirectly via erosive processes. It cannot be stated with complete certainty that the 'Pond/Tank' feature is a site of ritual deposition, in part because there is no atypical unique artefactual deposit, as it does not have particularly defining features such as an enclosure or associated temple structure, although there are associated structural remnants the feature appears to have been unenclosed. What can be stated is that the nature of the site itself and the size of the deposits recovered suggests that the 'Pond/Tank' feature had significance beyond the utilitarian. The idea of the 'Pond/Tank' feature representing a space for 'ritual deposition' is complex, as there is also no powerful premise for the ritualised offering of post-carbonised materials, except within the concept of cremation.

6.5. Traprain Law - New Dataset - Discussion - Research Question 4

What is the nature of the Traprain Law environmental context and its constituent vegetation communities?

In this discussion the Traprain Law palynological dataset is particularly pertinent as it clearly defines the dynamics of the multiple vegetation communities connected to the main Traprain Law summit site, whether this connection is based on influence or formation processes. One dynamic it reveals which is especially the responsibility of anthropogenic factors is arboreal versus grass/ruderal pollen presence. Noting the potential effect of reworking on the dataset, an overall trend exists showing the reduction of arboreal pollen presence whilst the reverse a significant increase occurs in regard to grass/ruderal pollen presence, this is a trend which extends throughout the temporal zones suggesting a long-term environmental change. Ascending counts of *Poaceae* alongside species groups such as *Cyperaceae*, *Cardueae* (cf. *aster*), *Lactuceae* and *Plantago lanceolata*, all of which are indicators of open land suggest organised clearance efforts by local communities. The heightened presence of *Plantago lanceolata* in particular might suggest a reason for this practice, as *Plantago lanceolata* is often classified as an arable agricultural indicator. The significant counts of *Plantago lanceolata* alongside the presence of carbonised cereals throughout the main Traprain Law summit site assert that the curation of the open Traprain Law landscape was motivated by arable agricultural practices. By Zone 3, this balance of the arboreal versus the grass/ruderal appears firmly established as the flora presence within the palynological counts is quite diverse and consistent (Figure 4.3). Alongside the aforementioned species there are varied counts proving presence for *Cerastium*, *Caryophyllaceae*, *Cichorium intybus* (t.), *Ranunculus acris*, *Rubiaceae*, *Botrychium*, *Polypodium*, etc. A variety and consistency of species presence within an environmental context is often an indicator of established ecosystems, that are relatively secure and have been exposed to only limited change outside the boundaries of a common regular and established taskscape. This acknowledges that ecosystems are often resistant to, and form around regular anthropogenic activities undertaken within a landscape setting, in the case of Traprain Law this would include arable agriculture. The environmental context is not largely affected by this taskscape as the premise of the activity helped to form the localised ecosystem and to some extent the vegetational communities present are dependent on the continued taskscape. The environmental context of Traprain Law is fundamentally human-controlled and in order to keep the open landscape profile continuous engagement with an arable agricultural taskscape is required. The majority of the species present within the Traprain Law palynological profile are consistent with an open landscape, and with environmental subdivisions including pasture/meadow, arable fields and waste/scrubland. Zone 2 is particularly problematic due to the extent of reworking. However, it is interesting to note the association of Context 3127 from which a significant charcoal assemblage was also recovered, which is not immediately clear in terms of arboreal palynological trends (Figure 4.3). There is a momentary increase in *Betula pubescens* before this again decreases, this could potentially indicate anthropogenic engagement with secondary woodland management practices for the purpose of resource preservation or natural recovery as a result of non-maintenance or absence from open grass/ruderal communities. There remains throughout a dominance of open landscape vegetation communities however neglect of peripheral areas might have allowed for some period of secondary woodland encroachment/recovery, a plant such as *Betula pubescens* fits the profile of a pioneer species. The profile of Zone 1 further supports via diversity and consistency of species presence that the open nature of the Traprain Law landscape was established prior to later Prehistory and was on the whole consistently maintained with sparse evidence of arboreal encroachment except for a few minimal instances. A positive trend in *Pinus sp.* (Zone 3) in southern lowland Scotland as Traprain Law is, is potentially intriguing as the species group is more commonly associated with northern Scotland where the climate for many varietals is more suited. If the *Pinus sp.* group is becoming more common around the main Traprain Law site, then it could potentially indicate a period of climate cooling post-late Iron Age. This is not entirely surprising as climates naturally go through cooling and warming periods and the difference in temperature required to enable particularly successful *Pinus sp.* growth is minimal. The climatological disparity between southern and northern Scotland, the lowlands and the highlands, has not been severe enough to exclude the possibility of *Pinus sp.* growth in either region, it is the Zone 3 increase which is quite significant which is telling. Whilst it is likely that climatological fluctuations occurred and affected the Traprain Law environment, these do not appear to have been extensive enough to majorly alter vegetation community profiles, instead the most significant factor for change in this instance is anthropogenic. This is further supported by the cereal assemblage recovered from the main Traprain Law site, this is dominated by the reliable and hardy *Hordeum sp.* crop, with lesser presence of *Triticum sp.* specifically Emmer *Triticum*, which are considered to be more palatable but on the whole less hardy. The simple presence of the assemblage supports the assertion that arable agriculture was an important environmental aspect of the Traprain Law landscape and taskscape. Beyond this the choice to cultivate *Hordeum sp.* in greater proportion than *Triticum sp.* suggests something as to the Traprain Law communities' confidence in local cultivation potential. Whilst the assertion has always been that the Traprain Law climate is/was mild and that the sediments surrounding the site are naturally inclined ease of agricultural taskscapes (ard-ploughing), the Traprain Law community chose the dominant crop species at least in part based on reliability. Although this may have more to do with confidence in the agricultural scheme than environmental proclivities, it does seem to indicate that environmentally the region may not have been as optimum as previously thought. This is highlighted by the cereal $\Delta^{13}C$ values which suggest a high incidence of water stress, it has been suggested that this is a result of the poor water retainment of local light sediments (Figure 2.3). This is an aspect mirrored at other sites with similar sediment profiles such as Stanwick and Danebury (Figure 5.7). In this case the Traprain Law environs are not the agricultural 'goldilocks zone' typically described. There is evidence, provided by the Traprain Law cereal $\delta^{15}N$ values, as all specimens demonstrate localised nitrogen correction of sediments, with low-nitrogen materials. This would have increased potential for sediment water retention. The weed seed assemblage recovered from the main Traprain Law summit site which includes *Polygonum spp.* (Knotgrass) nutlet, *Brassica*/*Sinapis spp.* (Cabbage/Mustard), *Chenopodium album* (Fat-Hen), *Chenopodium*/*Atriplex* (Goosefoot/Orache), *Plantago* *lanceolata* (Ribwort Plantain), *Poaceae* undifferentiated (Grass), *Rumex crispus/obtusifolius* (Curled Dock), etc. is also highly indicative of arable production as all these species are known to require extraction during cereal processing and are often present in residues. In this case *Polygonum spp.* (Knotgrass) is particularly interesting as the species has previously been considered an indicator of disturbed sediments, due to the ability of the seeds to remain dormant for years requiring significant periods of sunlight to provoke germination. This supports the concept of continuous arable production and therefore environmental upkeep of grass/ruderal vegetation communities, as the sediments are potentially disturbed for the purpose of agriculture. Broadly the entire weed seed assemblage is consistent with arable agricultural fields and/or disturbed waste ground, environments in some cases incidentally maintained via anthropogenic involvement in agriculture. The Traprain Law charcoal assemblage is dominated by *Corylus avellana* and *Betula sp.* with *Quercus sp.*, *Salix sp.* and *Alnus sp.* also proportionally representing as significant, this would seem to indicate that the woodland environments within the Traprain Law landscape are consistent with a secondary profile. With the exception of *Quercus sp.* these species groups are relatively quick to regenerate and are often targeted for coppicing management which greatly increases the wood resources available from a single tree. It seems probable that coppicing as a form of woodland management and resource optimization did occur within the Traprain Law secondary woodland environments, particularly as this is indicated by charcoal assemblage ring counts which ranged from 2 to 9. These ring-counts are within the common range for coppiced material from *Corylus avellana* and *Betula sp.*, this would indicate the extent to which anthropogenic involvement shaped the Traprain Law environmental context. Other species are present in lesser amounts within the Traprain Law charcoal assemblage, these include *Maloideae sp.*, *Pinus sp.*, *Fraxinus sp.*, *Ilex sp.*, and *Prunus sp.* The variety of species present within this assemblage and therefore within the Traprain Law secondary woodland environment indicate that the woodland has been relatively stable and unaffected by major changes in localised environments, potentially then this is intentionally preserved primary woodland with regeneration caused by anthropogenic management practices therefore presenting as secondary woodland. The presence of *Alnus sp.* with relative commonality suggests that there is an abundance of saturated sediments within the locality, as this is a preferred growth state of the species. However, the $\Delta^{13}C$ charcoal values in this case both support presence of secondary woodland whilst potentially indicating at least minor water stress for some species such as *Salix sp.*, *Betula sp.* and *Alnus sp.*. The homogeneity of the $\Delta^{13}C$ values in this case suggests the potential that all the tested specimens were sourced from similar growth conditions. Naturally this would mean that whilst all species groups experienced conditions suitable for growth, with no evidence for significant water excess, the conditions were also not necessarily optimum. The same is true for the charcoal $\delta^{15}N$ values which demonstrate relatively homogeneity, at medium-high levels on the whole. Potentially then an area of secondary woodland was purposefully maintained for resource extraction in an area which if subjected to clearance would be unsuitable for arable cultivation due to sediment conditions. In some instance woodland has been employed as an effective defence against seasonal flooding, it is entirely possible that this was a factor in management of the Traprain Law environmental context in some areas as there is a local flood plain fed seasonally by multiple tributaries. Areas of woodland would have been an invaluable resource hub for not only fuel materials but supplementary subsistence products like the fruits produced by many *Maloideae sp.* It is logical that some areas of woodland were purposefully maintained by the Traprain Law community for the purpose of resource supply longevity. The $\Delta^{13}C$ values associated with the Traprain Law charcoal assemblage suggest that the environment was not optimal across vegetation communities, the Traprain Law landscape was varied in terms of levels of saturation, sediment viability, humidity, etc. however there is relative homogeneity in $\Delta^{13}C$ values. The $\Delta^{13}C$ values of the Traprain Law charcoal assemblage create a picture of a common environment in terms of growth conditions for various arboreal vegetation communities. The Traprain Law vegetation communities quite apart from benefiting from a naturally optimal environmental system, flourished due to anthropogenically curated conditions. This was the major contributing factor to the agricultural dominance of the region, curated by clearance sustained by systems of sediment supplementation. This 'Goldilocks Zone' of growth conditions was not entirely naturally occurring and the balance of the Traprain Law environmental context was largely anthropogenically curated.

6.6. Traprain Law - New Dataset - Discussion - Conclusion

The research questions expressed in relation to the new Traprain Law data assemblage have been discussed and assessed to the potential possible with the available dataset. The nature and extent of subsistence and agricultural practice for the Traprain Law community is a system which is not extremely high maintenance, however, it does require the amendment of local sediments to curate the image of the naturally fertile environs often associated with the Traprain Law site. Agricultural practices are key for the Traprain Law community which stands in a landscape that with basic amendment has a natural proclivity for high agricultural productivity, although there is little evidential basis for direct involvement in agriculture instead the association was potentially supervisory. There was an awareness of the landscape for the Traprain Law community, as decisions were made which appear to have considered the possibility of over supplementation with low-nitrogen materials commonly chosen over high-nitrogen materials as fertilizer despite availability. Whilst cereal residues were recovered from the main Traprain Law site direct evidence of significant cereal presence on the summit was minimal, there are no obvious storage facilities or major accumulations of processing debris which brings into question the permanency of year-round occupation at the summit and the nature of high-status Iron Age sites in general. What little cereal-based evidence is evident at Traprain Law is mirrored by the minimal evidence of subsistence beyond *Hordeum sp.* and *Triticum sp.*, while it is clear that the community could and probably did supplement their diet through wild resources further definition of this is currently impossible. The Traprain Law community fuel profile appears to demonstrate a relative monopoly over local wood resources, as that is the extent of the materials with inclusion in the profile whilst environ site profiles are significantly more diverse. This could be a result of the high-status nature of the site and some sense of ownership or perhaps even stewardship over the surrounding environs. The profile itself is indicative of established secondary woodland, dominated by species groups such as *Corylus avellana* and *Betula sp.* which are atypical within coppicing management systems. This is the system which seems to have been enacted at Traprain Law as indicated by the charcoal assemblage ring-counts, coppicing would maximize the productivity of the secondary woodland environment for fuel purposes. A system which was likely necessary due to the reduction in secondary woodland environments by clearance for agriculturally stable land. Little else can be stated as to the Traprain Law fuel profile with the exception that it is quite diverse across arboreal species, leading to the idea that wood collection may also have been somewhat opportunistic. The nature of the 'Pond/Tank' feature contexts has been an aspect of some debate since the Cree (1923) excavation, with debate varying between a utilitarian purpose and ritual association. At first the assemblage associated with the 'Pond/Tank' feature is so varied and of low quality, consisting of broken fragmentary artefacts and residual ecofacts, that the first purpose seems more probable. The nature of the assemblage is more comparable to midden residues, with the first suggestion being that a midden deposit has eroded over time into the waterlogged 'Pond/Tank' feature. However, despite there being no atypical unique artefactual deposit, the size and breadth of the entire assemblage combined with the high elevation and associated waterlogged context suggests the 'Pond/Tank' feature may have significance beyond the utilitarian. The definition of a votive object has also shifted, so that in fact offerings quite apart from being set typologies with symbolic significance are more probably associated with individual personal wealth or the availability of resources. The lack of presumably high-status depositions is at odds with the nature of the wider site, this is potentially explainable if the carbonised cereals of the assemblage are noted as being a more valuable site resource. It is the conclusion that the 'Pond/Tank' feature in the Traprain Law summit for some period of time existed in a minor ritual capacity for the deposition of votive offerings. The Traprain Law summit community was instrumental in shaping its environmental context and constituent vegetation communities alongside its potentially satellite environs sites. The dominant feature of the Traprain Law environmental context was arable agricultural fields curated purposefully through clearance of secondary woodland throughout Prehistory as demonstrated by the palynological profile of the site. This dichotomy between the arable agricultural potential and small areas of secondary woodland appears to have been constantly maintained by the community as arboreal pollen remains low throughout occupation and indicators of agricultural activity are sustained. The abundance of species such as *Alnus sp.* within the charcoal assemblage appear to suggest areas of relative groundwater saturation as these are the growth conditions preferred by the specimens in question. However, this is at odds with the charcoal associated carbon dataset which indicates minor water stress in *Alnus sp.*, *Salix sp.* and *Betula sp.*. Potentially then in the vein of optimization, an area of secondary woodland was purposefully maintained for resource extraction in an area which if clearance was undertaken would be unsuitable for arable activity. Traprain Law sits in a naturally varied environment in regard to naturally occurring growth conditions, many aspects of these systems show evidence of proactively being optimised for growth which makes the agricultural dominance of the region unsurprising. However natural certain factors of the Traprain Law environmental context appear, ultimately the balance of the area was anthropogenically curated by clearance practices and continual maintenance of vegetation communities. Whilst answers have been provided for all the stated research questions in regard to the new Traprain Law dataset, many aspects of the Traprain Law environmental situation and association require further clarity. What can be stated with certainty is that Traprain Law occupied a unique space within its landscape and that it influenced and controlled its environmental context to the communities' ultimate benefit, and that this process was resource focused and resource driven.

A primary pillar of the significance of this research is that it begins to connect some of the various archaeological research regarding Traprain Law, in particular acknowledging the long history of the site record focus on structural remnants and connecting this to the occupational debris and less monumental site features. As an aspect of this process also highlighting the disconnect between the various Traprain Law investigations and the need to address this issue for a more complete site account. It also introduces the first ecofact plant-orientated investigation of the Traprain Law site, enriching the understanding of the economics and environment associated with the community. This has further illuminated previously neglected aspects of the Traprain Law system such as community-environment interactions, agricultural systems, place and status within a landscape, the environmental qualities of the region, environmental management systems, resource prioritization, etc. Previously Traprain Law has been acknowledged as a high-status site due to its classification as a hillfort and a collection of high value artefacts recovered from the summit, now this status potentially is reaffirmed by evidence of control and manipulation of localised environmental systems and vegetation communities. The power of the Traprain Law community is acknowledged through the sustained dichotomy of arable agricultural fields via clearance over secondary woodland, the presence of the community in the local environments was not passive but active due to the control exerted over local productivity. In this way this research is also significant as it further connects the Traprain Law site to its environmental context and highlights the quality and nature of this connection. We can now begin to see the Traprain Law which was founded on local enterprise and in apparently fertile lowland pastures. Despite the valuable conclusions of this research, it has been limited from the first instance by the nature of the recovered assemblage which was not very extensive, limited contexts had associated botanical materials and those that did were extremely residual. The most extensive aspects of the assemblage were recovered from the 'Pond/Tank' feature meaning much of the interpretation of the data was limited by the parameters and nature of this context as either a ritual deposit or midden materials. The number of contexts that are associated with new plant-based data is limited to <20, as already stated the bulk of this assemblage is associated with the 'Pond/Tank' feature which constitutes <6 contexts. The entire assemblage is further limited by the on the whole sub-standard preservation at Traprain Law, the majority of the contexts presented as relatively acidic ranging from 4.1 to 5.4 PH, however moisture and organic content were at unsuitable levels, 15-30% and 10-25% respectively. This meant preservation of proxies for environmental dynamics was impractical in most instances with the notable exception of the 'Pond/Tank' feature, making this again the focus of interpretation. The low state of preservation is reflected in the classification system applied to all plant macrofossils and charcoal, the high population of the lower brackets of this classification system further reduced the dataset suitable for further analysis, for carbon and nitrogen isotopic assessment. Prior to this identification based on morphological traits was limited across the assemblage as a result of inferior preservation. As a result of these limitations, a high degree of caution has been maintained throughout interpretation and much has been discussed in terms of the balance of probability. Of course, research is always limited by the questions asked and much of the focus of this thesis has been on the environmental context and plant-focused management systems of Traprain Law and as with most research this has highlighted further questions which should be addressed.

There are of course a great many potential directions for future research in regard to the main Traprain Law summit site, despite its extensive excavation history and the contribution of this research, much remains unknown. There are, however, some areas which this research itself has highlighted which require advancement in order to better understand the Traprain Law community dynamics. Admittedly a number of these would require further fieldwork, it is not however hard to justify excavation for Traprain Law as its stratigraphical integrity is consistently threatened by erosion via 'pests' and the activities of people. The first of these would be a more in-depth investigation into the contextual nature of the Traprain Law site features, those known and currently unknown. As stated in this research currently no specific site of resource, in particular cereal grain, storage has been identified at the site, there is also an unusual lack of cereal processing residues which perhaps suggests that this context too still remains undiscovered. Of course, these could have been disregarded in earlier excavation where their evidential basis recovery was not a priority. A contextual review would allow more solid conclusions to be drawn relating to key resource processes and the nature of the site regarding aspects such as permanency. The question of the many potential aspects of the nature of the main Traprain Law summit site is also another possible research trajectory. A review of all current data, collection, if possible, of more datasets, and a comprehensive map of features related to the summit site, together would allow a better understanding of the true breadth of purpose of the Traprain Law community. Currently the only secure assertion in regard to the Traprain Law community is its high-status nature, what is meant by this other than profitable interactions with Roman culture, presence of apparent defensive structures and landscape presence is largely undefined. Further review and collection of data has the potential to answer questions such as whether the site was occupied seasonally, part-time, full-time or even consistently, whether working debris recovered is consistent with purpose as a production site and whether the site has any ritual significance beyond the 'Pond/Tank' feature. These are all aspects which should undergo further investigation in order to further define the nature of the Traprain Law occupation and the wider significance of the site within its landscape and to Iron Age studies. The last trajectory for further research to discuss has already been highlighted and given a foundational basis by this study, there exists potential with further data collection, in particular palynological study, for further higher definition environmental reconstruction. A more comprehensive dataset would allow the application of more visual data analysis via, for example Multiple Scenario Approach. This would visually present Traprain Law within its environmental context and perhaps allow a profile of environment characteristics in relation to a hillfort site. This could be further expanded into a larger study which focused on how hillfort sites might affect the environment in which they are situated which would be beneficial to understanding of community-environment interactions in Prehistory. It is the intention of this research to encourage further investigation into what is perhaps one the most well-known hillfort sites in Scotland, because whilst its name, Traprain Law, is known much about the community that inhabited 'Farm Hill' remains unclear.

7. <u>DISCUSSION - TRAPRAIN LAW, ZONE 1, ZONE 2 - COMPARATIVE</u>

7.1. Discussion - Traprain Law, Zone 1, Zone 2 - Introduction

There is a great deal which can potentially be drawn from comparison of the new Traprain Law data assemblage to other published environs datasets, those sites previously summarized and classified as either Zone 1 or Zone 2. The connections between these sites are many and various, with analysis of these connections highlighting the qualities of inter-site relationships and transforming the current knowledge of wider systems, communal, geo-political and environmental. There is certainly an evidential basis for extensive trading networks between Traprain Law, Zone 1 and Zone 2 with movement of products including Samian ware, Roman glass items, shale/cannel coal decorative items, wood resources, cereals, etc. This is but one practical aspect in the breadth of interconnection between these sites and demonstrates the geo-political influence of Traprain Law but also its reliance on a closely linked network of sites for subsistence purposes. The sites are also closely connected through presence within the same environmental contexts, which they were reliant upon for much of the resources of subsistence. There is evidence that a network of environmental management was enacted inter-site across environmental contexts for the purpose of maximizing potential resource extraction. This suggests at the level of cooperation and openness to collaborative schemes which potentially existed cross-community within the Traprain Law environs. The key literature in regard to this discussion includes the Traprain Law Environs Project 2000-2004 (Haselgrove, Carne & Fitts: 2009), 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' (Lelong & Macgregor: 2008), 'An Iron Age Coastal Community in East Lothian' (Haselgrove, McCullagh & Crone: 2000) and 'An Inherited Place: Broxmouth Hillfort and the South-East Scottish Iron Age' (Armit & McKenzie: 2013). Alongside the new Traprain Law data and the 1999/2000 excavation preliminary official reports including the 'Traprain Law Summit Project, East Lothian' Data Structure Report 1999 (Armit et al: 1999) and the 'Traprain Law Summit Project, East Lothian' Data Structure Report 2000 (Armit et al: 2000). This will allow comparison of some of the most impactful excavations in East Lothian, sites which epitomize the Iron Age and Roman period in the East Lothian region with Traprain Law, a site name which is well known but a site that has yet to be fully understood. Many of the sites discussed are peripheral, hinterland and/or potentially satellite sites to the main Traprain Law summit community, the probability of direct involvement between these sites is significant. As already evaluated the new Traprain Law dataset is conspicuously impacted by the less than optimum preservation conditions of the summit site, the dataset is therefore relatively reduced in terms of material survivability rates and identification probability was reduced due to lack of preservation of morphological characteristics. However, a suitable assemblage was defined for further analytical testing including carbon and nitrogen isotopic investigation. The assemblage is also the most complete and intact plant-based dataset available for the site of Traprain Law as previously this area of research had been neglected there. The environs, Zone 1 and Zone 2 site assemblages are on the whole extensive with a breadth of initial plant-based data available for comparison, despite reports that preservation conditions were often less than optimal. Despite the assemblage as a whole being extensive it is focused on a small number of the total sites excavated by these projects; some sites have single specimens only or reduced/minimal plant-based data associated with them either due to lack of recovery stratagems or the preservation conditions described. There is also an issue in terms of the lack of secondary analytical techniques applied to these datasets, there is no directly comparable environ data available for the Traprain Law isotopic dataset because of this, which again reduces potential comparative interpretation and system understanding. In fact, application of isotopic techniques to plant-based datasets is currently under used in archaeology, as such only two comparable datasets were identified in Britain, Stanwick and Danebury. The Traprain Law environs, Zone 1 and Zone 2, constitute the low elevation expanses and the northern coastline in some instances of East Lothian, within these zones a great many environmental contexts exist but the area is dominated by open agricultural field expanses to some extent artificially created by early communities. Other environmental contexts include primary/secondary woodland and the coastline previously mentioned. Traprain Law sat, and still does sit, on a singular high elevation Laccolith in the centre of an expanse of the open agricultural fields which so typify the Traprain Law environs (Figure 1.3). The site dominates the landscape geomorphologically and visibly, this could only be a valuable trait in an environment which was also extremely resource valuable.

7.2. Discussion - Traprain Law, Zone 1, Zone 2 - Research Question 1

(Figure 7.1, 7.2, 7.3, 7.4, 7.5)

How did Traprain Law and the Zone 1 and Zone 2 environs sites interact with surrounding environments, how do these interaction decisions compare and contrast between sites?

There is a significant amount of contrast not only across Zones and sites but also site typologies and temporally in regard to the way in which environs communities interacted with surrounding environmental contexts. Within the category of Zone 1 there are sites which are clearly ceremonial in nature, on the whole these sites are earlier than the main Traprain Law site, whilst the occupation sites within this zone do seem to overlap with the Traprain Law occupation. The way in which Zone 1 communities, be these ceremonial or domestic, interacted with the surrounding environs changed significantly across time. One aspect which clearly influences community-environment interactions is local resource availability, the sites of Whittinghame and Standingstone both of which are in peripheral proximity to an eastern seam of what is now termed the Lothian Coalfield appear to have employed surface coal deposits as a significant contribution to the site fuel profile. This is something which is not seen in any other Zone 1 sites and is completely resultant of resource proximity, environments were interacted with based on resource requirements at least to some extent (Figure 7.3). This is notable at Whittinghame and Standingstone again which appear to monopolise on coastal proximity with the use of *Fucus sp.* either as packaging for other coastal resources (Standingstone) or potentially as 'green manure' (Whittinghame). Interestingly these sites are not particularly in closer proximity to the coastal region than other Zone 1 sites, however there is no other evidence for coastal plant-based resource interaction. The ways in which Zone 1 sites interacted with woodland environments also varied significantly, with the one commonality being the unsurprising ubiquity of *Corylus avellana* nutshell as a subsistence product wild-harvested to supplement dietary profiles (Figure 7.4, 7.5). This would suggest that the products of environments were considered during community-environment interactions, involvement remained in this capacity resource driven. The charcoal assemblage of Whittinghame and Standingstone, *Betula sp.*, *Corylus avellana*, *Alnus sp.*, *Sambucus sp.*, *Calluna vulgaris* and *Quercus sp.*, has been deemed to be a result of site maintenance practices, preventing new or re-growth. In this case wood is not a required resource for a fuel profile dominated by coal, it is interacted with in a clearance capacity to maintain current environmental boundaries, another factor in this may be both sites agricultural involvement as 'weed' assemblages appear to indicate that nearby sediments were nitrogen supplemented. A similar situation appears to have occurred at Knowes which contains significant proportions of Fat-Hen within its 'weed' assemblage, which is often referred to as an indicator for nitrogen supplemented sediments and agriculturally active areas. Knowes on the other hand appears to have been quite reliant in terms of fuel on wood as the charcoal assemblage is diverse including *Alnus sp.*, *Quercus sp.*, *Betula sp.*, Blackthorn, Cherry, *Salix sp.*, Rose-type and *Corylus avellana*. This would indicate proximity to secondary woodland which due to the sites relatively long occupation period must have been to some extent maintained. In this regard because the resources associated with this area of secondary woodland are integral to site prosperity, community-environment interactions are undertaken sustainably as there is no apparent evidence of resource depletion or extinction. Knowes also appears to have a more diverse environmental context than other sites, the 'weed' assemblage indicates nettle, knotgrass and thistle indicative of waste/disturbed ground, sedge, moss and marsh pennywort indicative of saturated areas and buttercups, pinks, cinquefoils and violets indicators of grassland, meadow or pasture. The grassland, meadow or pasture environment appears to have been potentially hand maintained as Onion Couch tubers recovered from an oven context would otherwise have been an unsustainable resource. If the area was grazed, as would usually occur with such an environment, as a result of pastoral agricultural practices, the Onion Couch as a preferred edible would have been consumed by livestock. Such an environment would have required significant maintenance and no other clear example of it occurs throughout the Traprain Law environs (Figure 7.4, 7.5). This might suggest that the Knowes community was less agriculturally focused than for example Whittinghame, Standingstone or Foster Law, the last of which exhibits an extremely narrow environmental profile according to the 'weed' assemblage of well-manured arable agricultural fields surrounded by waste/disturbed ground. Many of the Zone 1 sites are associated with curated environments largely clear arable agricultural spaces, most of which also are associated with a form of frontier buffer environment of cleared waste/disturbed ground presumably to reduce the maintenance required to keep the natural wild environment regrowth from consistently encroaching on arable productivity as well as provide 'blank' space to move through. Standingstone, Phantassie and East Bearford were perhaps in closer proximity to these 'wild environments' as these assemblages suggest site usage of 'turves' which necessarily grow in largely undisturbed regions, in this case 'weed' and charcoal assemblages indicate sedge, grass, bracken and *Calluna* along with other amorphous material (Figure 7.3). In this case community-environment interactions would be limited up to the point of resource extraction, no direct involvement prior to this with the environmental context is required however long-term use of the resource would only be possible with future planning of extraction sites to allow successive regrowth. Clearance of a site via systematic burning as demonstrated at Standingstone and Whittingehame is an established trend temporally in the region as the earlier Neolithic ceremonial site of Pencraig Hill began prior to construction through ritualised clearance burning, in this case however charcoal residues appear limited to *Quercus sp.* and *Alnus sp.* The suggestion is that earlier sites interacted almost exclusively with primary woodland which as clearance practices extenuated developed into secondary woodland regrowth. This extensive impact of early detrimental community-environment interactions within the Traprain Law environs is perhaps most visible in the Pencraig Wood assemblage which is another example of an early ceremonial site however with a longer-term usage, still however broadly Neolithic. The Pencraig Wood site began with primary usage of *Quercus sp.* but across time from the mid-3rd millennium BC to the cremation period (1500-1260 BC) the assemblage diversified including *Alnus sp.*, *Betula sp.*, apple-type, *Quercus sp.*, rose-type, *Salix sp.*, blackthorn and *Corylus avellana*. Whilst these species are not mutually exclusive between primary and secondary woodland profiles, they are more indicative of an established secondary woodland environment. The later occupation site of Phantassie exhibits a similarly diverse established secondary woodland adjacent charcoal assemblage, also including *Hedera sp.* which requires established older woodland as it is sometimes symbiotic with older arboreal specimens (Figure 7.3). The presence of *Corylus avellana* at Phantassie with associated ring-count data indicating harvest at 12 years in 110-80 AD indicates that community-environment interactions potentially extended to coppicing practices. This would optimize the wood resource production in secondary woodland and provoke production of more construction suitable materials, this would be classified as a more proactive intrusive environmental management than there is previously evidence for in regard to Zone 1 community-environment involvement. This period also appears to involve an intensification of agricultural focus in the environs, as exhibited by the Howmuir site which appears to be an accumulation of midden materials on an agricultural field boundary. The sediments of this context demonstrate evidence of destabilization as a result of nearby high intensity arable cultivation. This could be an aspect of an enrichment system for arable contexts whereby midden waste is moved to close proximity of arable cultivation prior to distribution as nitrogen supplementation across the agricultural context. All the Zone 1 sites have aspects of the 'weed' seed assemblage or heightened levels of *Alnus sp.* in the charcoal assemblage, which could constitute indicators of heightened sediment saturation levels. These areas would not have been easily agriculturally viable and so would have been left largely unaltered with interaction not nearing anywhere close to management levels. High levels of ground saturation can only be altered or managed with intensive programs of drainage or irrigation diversions, this was not enacted within the Traprain Law environs perhaps because this was too time or resource intensive or saturation was too extensive or because leaving areas of saturation creates a water collection point to prevent inundation elsewhere protecting more viable agricultural spaces. It may have been that a lack of management style environment interactions was also a conscious environmental choice that communities actively made. Zone 1 sites exhibit community-environment interactions based on resource accumulation, intensive clearance of environments in the initial stages of settlement and as populations expand in favour of agricultural fields is followed by consistent maintenance of these curated environments and ruderal 'buffer zones'. But still in some instances community-environment interactions are intensely localised and personal, as at Knowes with environments maintained potentially for access to singular resources such as Onion Couch. The involvement of communities with the Traprain Law environs intensified over time with a greater extent and diversity of resource extraction, with the result that management of environments has greater archaeological visibility, for example the coppicing of secondary woodland. As sites became more entrenched in the landscape and permanence and prosperity of settlement defined communities, environmental interactions increased in number and variety perhaps as more was 'known' about the Traprain Law environs.

The sites classified as Zone 2 are outside or peripheral to the main Traprain Law summit site environs, but the environments in which these are situated are not isolated systems and community-environment interactions are inter-related. Both the Fishers Road East, Broxmouth and Fishers Road West sites comparably to the Zone 1 sites of Standingstone, Phantassie and East Bearford, demonstrate usage of composite 'turves' a resource isolated to largely undisturbed usually heathland regions (Figure 7.3). These are more 'wild environments' which are often the first impacted by large scale clearance activities provided saturation levels are not high, as this drastically increases the effort required to curate agricultural viability. This 'heathy turf' composite is evident at Fishers Road West, Fishers Road East, Eweford Cottages and Broxmouth through 'weed' seed and charcoal assemblages which include *Calluna*, *Ericaceae*, *Carex*, *Scirpus*, grasses and bilberry/cowberry. This might suggest a closer resource-based relation with the Traprain Law environs (Zone 1), which do have suitable 'turves' adjacent vegetation communities. In this regard Zone 2 community-environment interactions are similarly resource motivated with many 'wild environments' interactions limited to the singular point of resource extraction; in the case of heathland this seems particularly limited to 'turves' in terms of consistent resource-based interactions. Similarly, to the Zone 1 sites of Standingstone and Phantassie however Fisher Road East, Fishers Road West and Broxmouth had relative occupation prosperity and long-term use of heathland 'turves' resource would require future planning and negotiation of extraction sites in order to allow for regrowth. There is even evidence that the scars that 'turves' extraction creates within heathland environments are sometimes purposefully placed to act as territorial boundaries. The community-environment interactions within the Traprain Law associated system in this regard are often potentially multi-purpose, though territoriality is not particularly evident. Potential exists for intentional preservation of woodland environments at Fishers Road West as a source of 'wild' resources such as elderberries and *Prunus sp.* as indicated in the plant macrofossil assemblage but also as a form of arable agricultural shelterbelt from potentially damaging climatological conditions associated with coastline proximity. This is somewhat supported by the 'weed' seed assemblage of the Fishers Road East site which includes corn spurry and cornflower which prefer dry, acidic, sandy sediments, the context association of these with *Triticum* grains suggests that arable cultivation was occurring in boundary environments such as machair prior to the shoreline (Figure 7.1, 7.2). The cultivation of arable produce in such peripheral environments could be low productivity and would require environmental amendments and systems for protection against shoreline conditions like a shelterbelt. Problems such as salinity contamination and extreme climatological conditions are individual to coastline sites such as Fishers Road West and Fishers Road East however arable cultivation of peripheral environments occurred in earlier periods throughout the Traprain Law environs (Zone 1) and required intensive clearance and sustained community-environment monitoring. The Zone 2 sites with earlier associations, Eweford West, Eweford East and Eweford Cottages much like the earlier Zone 1 sites Pencraig Hill, Pencraig Wood and Overhailes have less diverse assemblages, though the Zone 2 sites are not quite as limited. The initial Eweford West charcoal assemblage is limited to oak, alder and hazel (3960-3710 BC), the Eweford East charcoal assemblage consists of willow, hazel and oak (2880-2580 BC) and the earliest Eweford Cottages charcoal assemblage (2890-2630 BC) is more diverse with alder, apple, hazel, willow, oak and elm all represented (Figure 7.3). Despite this increased diversity the assemblage profiles still broadly align with primary woodland and perhaps in the case of Eweford Cottages developing secondary woodland. All of the sites charcoal assemblages (including Biel Water and South Belton) across time become significantly more diverse, the later Eweford West charcoal assemblage for example includes alder, hazel, blackthorn-type, willow, apple-type, cherry-type, birch, rose-family and oak, this is more indicative of an established secondary woodland. Just as with Zone 1, Zone 2 sites probably oversaw development of secondary woodland environments in the spaces previously occupied by primary woodland prior to community associated clearance actions. The difference in the case of Eweford West is that this change appears to have occurred earlier between the Late Neolithic and Early Bronze Age, perhaps resource exhaustion occurred quicker, or resources were lesser in the first instance. Earlier irresponsible interactions depleted primary woodland resources, then occurred a period of inaction within peripheral clearance spaces which allowed regrowth of secondary woodland, then sustainable usage of newly developed resources and limited resource optimization focused management practices i.e. coppicing. Eweford West potentially highlights this later period of environmental respect, here defined as sustainable practices, as when the site underwent abandonment (approximately 2280-2030 BC), the ceremonial deposition of around 56000 cereal grains was undertaken. Whilst the true meaning behind this act cannot be known with certainty, there are many archaeological instances where upon 'moving on' from a site the occasion is apparently marked with deposition of products (Manning: 1972) (Hingley: 2006). This is perhaps some of the only evidential basis that community-environment interactions must have gone beyond management and the mundane and into the spiritual structure of early communities. As with the Zone 1 sites, *Corylus avellana* nutshell is ubiquitous throughout Zone 2 site assemblages, indicating that 'wild' resources were maintained, in the sense that they were not removed completely via clearance, for the enrichment of subsistence (Figure 7.4, 7.5). This type of interaction would have been limited to the seasonal, resources would have been located and then revisited potentially even cross-generationally, in this way a shared memoryscape would have existed communally associated with a specific 'wild' resource area. This is a form of almost ritualized maintenance which would have existed for all sites. Fundamentally Zone 2 sites also exhibit community-environment interactions based on resource accumulation and arable agriculture is a dominant feature of environmental change, the difference appears to be that Zone 2 sites in some instances exploited peripheral environments in order to curate agricultural viability, with 'buffer zones' less focused on environmental regrowth and more to do with natural protection from climatological extremes. As was the case with Zone 1, Zone 2 sites demonstrate community involvement with the environment intensified across time with greater extent and diversity of resource extraction, perhaps because in a way communities had 'learned' their environment, optimised aspects of it cross-generationally, a memoryscape of resource locations. This appears to have occurred earlier at Zone 2 sites.

The main summit site of Traprain Law is fundamentally different in the way in which the community interacted with surrounding environments; in this sense it is perhaps more comparable to Broxmouth (Zone 2) which is also a high-status hillfort site. Traprain Law, in contrast to the Zone 1 and Zone 2 (excluding Broxmouth) sites, is distant from the environment which it dominates, there is a deficit of evidence to suggest direct practical involvement with the mechanisms of environmental management. It is aspects such as the lack of processing residues and 'weed' seeds within the Traprain Law assemblage which suggest this distance, as it seems cereal processing was clearly not undertaken at the summit site. That is not to say that the community was completely uninvolved within the localised agricultural system, only that Traprain Law cannot be classified as an agricultural community (Figure 7.1, 7.2). The very nature of the Traprain Law site, like Broxmouth, as a hillfort with defensive features and elevations which suggest dominance of the landscape suggest that the main purpose of the site was not to be within surrounding environments managing productivity and resource extraction but instead to preserve the integrity of these resources from the non-community. Instead, it is in particular the Zone 1 sites but also those of Zone 2, with the purpose of situation within landscapes and direct responsibility for resource extraction and environment management, in particular these are the working communities of the agricultural taskscape. This is a system which was not intensive in terms of required involvement, instead community-environment interaction could be passive. The relatively minimal midden deposits in regard to extent of occupation period so far recovered from Traprain Law, might have been collected and transferred to 'buffer zones' of ruderal growth around agricultural production zones for use as a low-nitrogen sediment supplement. The cereal assemblage recovered from Traprain Law and associated $\delta^{15}N$ values suggest that it was in low-nitrogen supplementary materials such as midden waste that local cereal supplies were grown. This is exactly the context and situation that is associated with the Howmuir site, which is essentially a midden deposit re-deposited from the original generating settlement site. This is a passive way in which the Traprain Law community probably interacted with the surrounding agricultural environmental context. Of course, Traprain Law is also comparable to all Zone 1 and Zone 2 sites in regard to the presence of the ubiquitous *Corylus avellana* nutshell and the community-environment interactions this symbolizes. As with these other sites Traprain Law certainly had attached to the cross-generational community a memoryscape of wild resources, a plethora of seasonal interactions, maintained in communal consciousness and within the environmental context to supplement agricultural resources. Although, the process of obtaining these resources cannot necessarily be directly attached to the Traprain Law community, the possibility exists that these too were imports from the satellite sites which were directly within the environmental context (Zone 1). In accordance with the other later sites examined in regard to both Zone 1 and Zone 2, the Traprain Law charcoal assemblage is quite diverse including *Betula*, *Quercus*, *Corylus avellana*, *Salix*, *Alnus*, *Maloideae*, *Pinus*, *Fraxinus*, *Ilex*, *Ulmus* and *Prunus*, indicative of established secondary woodland. The case exists to suggest that Traprain Law as a community monopolized wood resources, as the majority of Zone 1 and Zone 2 sites have other identifiable components to the fuel profile often more dominant components as with coal at Standingstone and Whittinghame and 'heathy turf' at Fishers Road East, Fishers Road West, etc. If this is the case, then it supports the concept of the Traprain Law summit site demonstrating some degree of control or ownership over the Zone 1 environs and perhaps into the environmental contexts of Zone 2 sites, because it seems relatively clear that wood resources in the first instance are being used by the Traprain Law community. All of the sites, including Zone 1, Zone 2 and Traprain Law have charcoal profiles which at some point support the presence of secondary woodland, the most probable management methodology to maximize output of wood resources from such an environment is coppicing and it is liable that this occurred. The ring-counts of the charcoal assemblage for the main Traprain Law summit site range from 2 to 9 in *Quercus*, *Corylus avellana* and *Betula* roundwood specimens, this is consistent with coppiced secondary woodland. The same is true for the only other site with available ring-count data Phantassie, from which a *Corylus avellana* roundwood specimen was collected with a count of 12 years. The secondary woodland within the Traprain Law environs (Zone 1) and probably in Zone 2 as well was to at least some extent coppiced in order to maximize resource productivity, but again this interaction does not necessarily involve the Traprain Law community directly. There is a great deal of contrast in the nature of interaction decisions between sites, but ultimately this is because each community has a purpose in a wider intercommunity system, the same system, each with its own responsibilities towards local environmental contexts and vegetation communities.

7.3. Discussion - Traprain Law, Zone 1, Zone 2 - Conclusion

The capacity in which the Traprain Law community interacted with surrounding environments is in contrast to the nature in which Zone 1 and Zone 2 sites with direct placement within target environmental contexts interacted with the surrounding environments. There was significant change in the way communities interacted with surrounding environs across time, the first major influence upon this was the transition of sites in the region from ceremonial (Neolithic, Bronze Age) to domestic (Iron Age, Roman). With the movement from symbolic requirements in resource collection to subsistence dependent upon the local vegetational communities, the new high intensity focus of interactions began to reform environments. It is also clear that engagement with environments is also significantly resource-driven, those environmental contexts with greater propensity for subsistence products demonstrate greater diversity of interaction including minimal schemes of management in some instances. These sites helped initially to curate an open landscape optimised for arable agriculture through community-environment clearance interactions, these would develop into maintenance activities to prevent environmental regrowth and encroachment, also forms of consistent community-environment interactions. Many communities appear to have maintained frontier 'buffer' environments of cleared waste/disturbed ground around arable agricultural spaces, to both reduce maintenance requirements in terms of 'wild' encroachment effecting arable productivity as well as to provide 'blank' space to move through. Despite these wider trends there exists also individuality between sites in regards to environmental interactions, with more time-consuming methods of management occasionally dedicated to the attainment of 'wild' resources, as with the Onion Couch at Knowes. While secondary woodland was maintained for extraction of wood resources it was also optimized through coppicing practices in order to increase wood resource availability, this is again a resource-focused interaction however it is also one in which control is enforced on resource-producing species. As communities became more defined by occupation permanence and prosperity, the environmental interactions evidently increased in variety and in intensity, potentially because more was known in regard to the qualities of local environmental contexts.

The significance of this research resides in what it can tell us about the wider systems and inter-relationships of the Traprain Law environs region, much of the current archaeological research is isolated to site specifics which may indicate how communities individually functioned but without collective consideration this leaves a disjointed image of communal affectation. There are two distinct archaeological projects within the region which consider sites collectively. These are, the Traprain Law Environs Project 2000-2004 (Haselgrove, Carne & Fitts: 2009) and 'The Lands of Ancient Lothian: Interpreting the Archaeology of the A1' (Lelong & Macgregor: 2007). These describe wider systems and inter-communal interactions based on agrarian economies and a holistic approach to subsistence, however, there is a clear absence of discussion within this system of the dominant site within the region, Traprain Law, and the placement and effect of this site on the pre-described system. This research allows further investigation into the quality of localised systems of environmental management, not only through contribution of data but also through acknowledging the place of Traprain Law within systems. There is for example, with the inclusion of Traprain Law more significant data to suggest management of secondary woodland environments through coppicing, but also the dichotomy within the system whereby Traprain Law which is comparatively distant from this environmental context according to the palynological profile, also monopolizes wood resources. A dynamic emerges where, although it cannot be certain, it appears that Traprain Law used smaller communities as sources for resources as opposed to directly engaging with resource extraction from environmental contexts, this is particularly notable in regard to cereal resources. Previous to this research, although this hierarchy might have been acknowledged the conditions associated with it were largely unexplored. Despite the valuable contributions of this research, it has been limited from the first instance by the nature of recovered datasets in the region, which while variable, are only extensive in a few cases and have undergone minimal secondary analysis, interpretation is often limited to morphological identification. None of the comparable datasets recovered from the region which are comparable temporally and contextually to Traprain Law, have not undergone secondary levels of analysis such as carbon and nitrogen isotopic investigation. This has meant that in many instances interpretation of the Traprain Law dataset has stalled, cereal nitrogen and carbon isotopic values for example indicate that nitrogen supplementation occurred and no carbon i.e. water control system (irrigation) was built in the region. If a comparable dataset was available from an environs site, growth conditions could be compared which could then inform not only on the Traprain Law cereal source but also on the extent of the collaborative agricultural system in the region, such aspects would at least be more strongly supported suggestions. The recovery of plant-based datasets from many of the sites was impacted by less than optimum preservation conditions for organics in the region, some sites were more affected in this regard than others, leaving some sites with singular specimens only or reduced/minimal datasets. This has excluded some otherwise potentially valuable sites from wider discussion as the focus in regard to this research is plant-based datasets.

The potential directions for future research are numerous in terms of the Traprain Law environs and the wider East Lothian region, despite an impressive excavation and reporting evidential basis, there is still a great deal of opportunity for further exploration. This is perhaps in part because of the breadth and depth of data available for the region, that enough time has not yet been dedicated to deciphering the many possibilities of meaning, particularly in terms of the functioning of wider systems. At the heart of this is the question of what constitutes a hillfort, and there are extant studies which have constantly tried to define this within a set of parameters, there will undoubtedly be other such studies. The real trajectory suggested, however, is not what makes a hillfort a hillfort but what makes Traprain Law a hillfort. Many hillforts would find closer association with the name 'Fort of the Spear Shafts', whilst it is the opinion of this study that Traprain Law is more closely attached to the name 'Farm Hill'.

APPENDICES

Appendix 1

Notes on inter-site interactions, Traprain Law, Zone 1 and Zone 2, revealed by this study which are not environment focused and therefore not necessarily pertinent to the core research thesis. These are noted here as observations which might be useful to others research.

In the simplest terms the main Traprain Law site and those classified as both Zone 1 and Zone 2 are related to each other because they exist within the same space, in terms of environmental context and for many temporally. It is because of this that many of the same developmental processes are evident cross-site, including the movement towards permanent more typical sites of occupation. Many of the sites are directly situated on or are peripheral to the East Lothian coastal plain and are consequently associated with reportedly premium agricultural land enclosed by upstanding relief of igneous rocks, the Lammermuir Hills to the south, the Garleton Hills to the west, Gullane Hill to the north-east, and open to the coastline directly to the east. In the centre of this fertile 'grail' is Traprain Law an intrusive Laccolith and uncommon feature in Scotland. In this sense the landscape in which these sites would come to exist has always had a special status which across time would create a profile for East Lothian as an agriculturally productive county, prior to this association with agriculture the vegetational growth in the area may have highlighted the positive local growth conditions, despite the poor water retainment of local sediments. Which is perhaps one motivating factor behind early Prehistoric association of the area with ceremonial practices, the Zone 1 sites of Knowes, Pencraig Hill, Pencraig Wood, Overhailes and the Zone 2 sites of South Belton, Eweford West, Eweford East and indeed Traprain Law demonstrate evidence of this. All these sites relate to each other not only through existence in an inter-connected ceremonial landscape but also through their extinction or development to be subsumed by permanent occupational fixtures within the landscape. These later sites include (Zone 1) Whittinghame, East Bearford, Foster Law, Standingstone, Knowes, Phantassie, (Zone 2) Fishers Road East, Fishers Road West, Biel Water, South Belton, Eweford Cottages and the main Traprain Law summit site. Only a few sites survived this transition from the ceremonial to the domestic and only Traprain Law continues to demonstrate relatively clear ceremonial associations, with the 'Pond/Tank' feature during the Iron Age/Roman Period and later Medieval structures associated with a Christian burial. This shift is an aspect of shared experience across these sites, and it is probable that Traprain Law became the new ceremonial focus of local communities, the internalized practices of 'religion' and ritual belief as demonstrated anthropologically do not simply cease with the degradation of physical remnants. The Traprain Law, Zone 1 and Zone 2 communities were related and interconnected through experience of the shift from a landscape of ceremonial spaces to a perhaps centralized ritual belief focused at the Traprain Law summit site. It should be noted that this 'religious' aspect to environmental experience would not have degraded with the physical remnants, communities probably still associated areas such as Pencraig Hill with internalized ceremony and individual rituals, structured physical communal practices however perhaps now occupied a single space. The concept of 'shared experience' interconnects Traprain Law, Zone 1 and Zone 2 sites, not just in the 'religious' aspect but also in a far more fundamental sense, through existence within the same physical space. In the first instance this physical space constitutes the landscape itself, a foundation of human connection according to psychologists is 'eye contact' it opens the possibility to form connections within our brains and begins the development of our intentions, in particular the capacity for emotional connection (Koike et al: 2019). The breadth of the human ability to create connections through 'eye contact' extends further than 'one human individual to another human individual', it is possible for connections to form through visibility, when 'eye contact' is made with an animal, an object or in regard to this discussion, a space or place. All of the Zone 1 sites have potential for direct visual visibility to Traprain Law and many also have direct lines of sight to each other, this site 'eye contact' interconnects these communities based on the formation of intention that it allows and the potential for emotional connection. Whether these sites were constructed with the intention of a network of visibility or whether this was incidental, although the former is more likely, it suggests a mental probably emotional connection between communities. No matter the emotional quality of these connections it would have directly influenced the quality of inter-community interactions, a threat versus friend response would be particularly influential in this regard. Two sites with direct visual visibility, placed this way confrontationally for example to allow consistent surveillance of resources would provoke a threat response, inter-community interactions would be cautious. On the other hand, two sites with direct visual visibility, placed this way for a non-combative purpose for example to ease communication for collaborative environmental management would evoke a friend response, inter-community interactions would be agreeable. Existence within the same physical space and associated interconnectivity resultant of 'shared experience' also extends to the environmental context of a site. All of the sites, Traprain Law, those situated in Zone 1 and those in Zone 2 share aspects of an environmental context, the Traprain Law and Fishers Gate West palynological profiles for example depict open landscapes artificially created through clearance of arboreal environments, now populated with *Poaceae*, *Plantago lanceolata*, *Cyperaceae*, *Cardueae cf aster*, *Cichorium intybus*, *Cerealia*, etc. all indicators of grassland, arable fields and waste/scrub land. Communities encountering and curating such environments in close proximity to each other as these are, have 'shared experience' in regard to their interactions, responses and negotiations with these environmental contexts. This is particularly pertinent to the various 'weed' seed assemblages associated with these sites arable (cereal) productivity and processing many of which mirror each other. The environmental profiles created by these assemblages also demonstrate that all of these sites encountered similar vegetational communities, for example *Carex*, *Galium palustre*, *Poaceae*, *Alnus sp*., *Hydrocotyle vulgaris*, *Bryophyta sp*., etc. are all indicative of damp wetland environments or consistently saturated sediments. This profile, for damp wetland environments, is observable in the 'weed' seed profiles of (Zone 1) East Bearford, Standingstone, Knowes, (Zone 2) Fisher Road West, Fishers Road East and Eweford Cottages. This is only a singular example of a shared environmental context and there are many examples, but it demonstrates that these communities relate to each other in regard to everyday, mundane encounters with the environments which surrounded them, building on this it also suggests that resource access was potentially shared, just as was environmental space. The management and resource collection interactions within these shared environments would certainly have required inter-community negotiation, one method to achieve co-existence with shared resources would be environmental management strategies which worked across community boundaries, if such boundaries existed within the Traprain Law environs. It is demonstrably difficult, as attested by historical examples, for two non-communicating vastly different socio-environmental systems to co-exist effectively within even large environmental contexts. It is suggested that one cross-community environmental management strategy in relation to Traprain Law, Zone 1 and Zone 2 sites is the coppicing methodology in relation to the secondary woodland environmental context. This is a context which is accessed across all sites and the strategy would sustainably maximize wood resource production for *Corylus avellana*, *Betula sp*. and *Quercus sp*. all of which are present throughout site charcoal assemblages. Direct evidence for this practice is evident at Phantassie (Zone 1) which provides a single *Corylus avellana* roundwood specimen ring-count of 12 and at Traprain Law which presents ring counts across species ranging from 2 to 9. Secondary woodland is not a particularly populace environmental context in the Zone 1 or Zone 2 areas, as such resources would probably have been shared across sites, not only does this represent a negotiation interaction but the management of this environment through coppicing indicates further communication in terms of long-term environmental management and shared resource responsibility/planning. This cooperation regarding systematic application of environmental management methodologies extends further than coppicing strategy to a wider network of landscape wide management for the purpose of resource extraction. All of these sites, Traprain Law, Zone 1 and Zone 2 are environmental changemakers from the very foundations of their earliest site constructions, they are related because they shaped the landscape in which they are situated through schemes of management or mismanagement. Each site was involved in a wider trend of primary woodland clearance, which has become known as an atypically Iron Age process, these clearances extended to the point that zones must have met to form wider clearances. The individual efforts of communities created an open landscape, the process of which would have caused interactions and cross-community congregation would have made the process more sustainable, in regard to personnel and resources. Any miscommunication regarding, for example territorial aspects during this clearance process would have potentially verifiable hostile interactions. The population of so many sites existing in the same temporal context undertaking this process seemingly simultaneously in all probability indicates cross-community communication of environmental/resource management. Perhaps more convincing in this regard is the later exploitation of secondary woodland resources, which the charcoal assemblages of all sites indicate. In order for secondary woodland to exist regrowth must be allowed to occur. This is clearly a process which these environmental changemakers are allowing to occur cross-communally, an agreement may have existed between sites to cease clearance renewal in some areas and allow regrowth of secondary woodland profile species, there is evidence in the diversity within site charcoal assemblages that these vegetation communities were then allowed to become established. Whilst the lack of diversity observable in early site charcoal assemblages indicates that primary woodland resources may have been close to complete clearance or at least resource exhaustion. Inter-community interactions were to some extent resource and environment focused, with schemes and trends of management obviously bridging geographical gaps between communities. The ubiquity of 'wild' resources such as *Corylus avellana* nutshell across sites (Traprain Law, Zone 1, Zone 2), and the similarity of apparent site subsistence assemblages, indicates that communities may have shared memoryscapes at least to some extent. In a relatively passive sense 'wild' resources were obviously maintained; they were not for example completely removed by clearance trends. Interaction with these 'wild' resources would have been highly seasonal, with located resources revisited by community members cross-generationally, logically in this regard a shared memoryscape would exist as a form or 'wild' resource mapping communally. The shared nature of environmental contexts as already discussed combined with the obvious examples of cross-community management of environments, also acknowledges that 'wild' resource location would have been known cross-community. The existence of this connection would mean that the Traprain Law, Zone 1 and Zone 2 site memoryscapes would include the same 'wild' resource hubs, yet another point of resource-focused negotiation. What more personal inter-community system of interaction could exist than not only a shared taskscape but also a shared memoryscape. These communities in all probability managed local environments cohesively and maintained a 'memory bank' of knowledge about those environmental contexts which was widely accessible to those sites present within the same landscape.

The most clear and obvious exemplar of Traprain Law, Zone 1 and Zone 2 site interactions are those preoccupied with resource exchange, or more broadly a trading system. There is obvious diffusion of materials across the groups and communities, often enriching the subsistence practice at sites. Traprain Law seems to have a central role in this process of exchange across a range of artefact typologies and materials. Traprain Law as a high-status site had a far more wide-reaching interconnectivity regarding trade, this is perhaps most clearly emphasized by the recovery from the summit site of the Traprain Law silver hoard a collective of high-status, high-value products which had Roman cultural association. The close proximity to Traprain Law of monumental Romano-British sites combined with obvious Roman cultural products recovered from the main summit site, provides a strong evidential basis for a close trading relationship between native British and Roman cultures. This is a trend, trade between Roman sites and high-status British sites, which is common throughout Iron Age Britain and is commonly associated with diplomatic relations between the two cultural groups, this itself is often suggested as a cover for intentional Romanization of native culture and a subversive method of control (Hingley: 2005). Traprain Law as the localised site of high status appears to have acted as a point of diffusion for Roman cultural items and materials into certainly Zone 1 sites, this is of course not for items comparable to the Traprain Law silver hoard. A number of fragments and bead-forms of Roman glass were recovered from the main Traprain Law summit site and communities including Phantassie, Knowes and Standingstone. The site of Phantassie in particular also contained atypical Roman pottery sherds, Samian ware, within its artefactual assemblage. This means that Traprain Law was a culturally influential site locally, through introduction of Roman cultural items into local trading networks concepts of identity and values would have been impacted. The summit site of Traprain Law also exhibits significant working debris in regard to formation of shale/cannel coal materials into decorative items, there are also many instances of these products within Zone 1 communities. Many examples of shale/cannel coal bangles and rings are contained within the assemblages of Knowes, Standingstone, Whittinghame and Phantassie. In terms of inter-community interactions this would suggest that Traprain Law formed wider ideas as to what decorative items were desirable for trade, what the indicators essentially of the more high-status communities and individuals were. Potentially the closer and more extensive Zone 1 or Zone 2 site interactions with Traprain Law were the greater the influence that site had within a trading capacity and geo-politically. It has long been acknowledged that items of high status are indicative of control or dominance within a political system, an individual or communities' status is reflected in ownership of certain material items (Stahl: 1989). In this sense, it is probable that in any interactions between the sites of Zone 1, Zone 2 and Traprain Law, Traprain Law was dominant, with control of the communication also residing there. However, there is also an evidential basis to suggest that Traprain Law was reliant to some degree on the productivity of Zone 1 and Zone 2 sites. As has been previously acknowledged the main Traprain Law summit site exhibits extremely minimal evidence of cereal processing, the residues which do exist could in fact amount to a few singular events. There are a number of sites which seem to have a particular focus in terms of wider purpose on cereal processing, these include (Zone 1) Standingstone, Knowes (excluding *Triticum sp.*), Phantassie, (Zone 2) Fishers Road West and Eweford Cottages all of which contain within their assemblages either chaff constituents, indicator 'weed' seeds or parching 'turves' contexts. The suggestion is that Traprain Law did not have a role in cereal processing and that with the high-status nature of the site came an obligation for the smaller Zone 1 and Zone 2 sites to provide a quota of cereal for consumption by the Traprain Law community. All the Zone 1 and Zone 2 occupation sites, those classified as settlements, have evidence of arable (cereal) cultivation responsibilities only a select number, those already mentioned, have significant evidential basis for the processing of this resource. The potential therefore exists for this network of sites levels of cooperation to extend further, with outsourcing of cereal processing to specialised sites with this responsibility. This would indicate inter-community interactions which were predetermined to some extent based on placement within a system of resource processing and an inter-site reliance certainly in regard to Traprain Law and its subsistence prosperity. An evidential basis also exists for specialised trade between Zone 1 and Zone 2 sites directly, particularly in regard to specialised coastal resources. This is particularly the case regarding *Fucus sp*. resources which are prevalent at the Zone 2 coastal site of Fishers Road East, this material has a number of uses including processing into potash a residue necessary for glassmaking, as a high-nitrogen supplement material for arable fields, as packaging for other coastal products, etc. Interestingly, despite no relation to the coastal environmental context, *Fucus sp*. specimens also occur at the Zone 1 sites of Whittinghame and Standingstone, this is particularly the case for Whittinghame which has an extensive assemblage of *Fucus sp*. This resource can only be obtained from the coastal context and as such the case is made for direct exchange of resources from Fishers Road East to Whittinghame and Standingstone, an interaction based on resource supply versus resource demand. The entire environs agricultural system may have depended on inter-site cooperation, not only does Traprain Law demonstrate minimal evidence of cereal processing but comparative to the site size and occupation chronology there are relatively minimal obvious midden deposits. This could indicate a larger system of community waste redistribution to on site midden contexts at the edge of agricultural cultivation, as at Howmuir. The nitrogen isotopic analysis of Traprain Law cereals supports that arable agriculture used at least low-nitrogen materials to supplement sediments. This further supports the argument for a wider system of site connectivity based in resource optimization, but this system also extended into the local geo-political situation. Quite obviously at the centre of this is the site of Traprain Law, ultimately the nature of this site would determine the nature of the wider system of inter-community interactions. If the main Traprain Law site is not in fact a permanent settled community, but instead a temporary perhaps even seasonal trading hub or a space for inter-community geo-political, diplomatic resolution and discussion, then it is not an 'overseer' of communities of inferior status, it may in fact have been an institution owned by Zone 1 and potentially Zone 2 communities for the betterment of inter-community relations. The full spectrum of types of interaction are evident to different extents between the related sites of Traprain Law, Zone 1 and Zone 2, these can however be narrowed down into 3 sub-categories as follows, within the Traprain Law environs communities **collaborated** to create optimum conditions for resource extraction, communities **transacted** to obtain status signifiers and products necessary for subsistence, and communities **conversed** with each other about their ideas, beliefs and plans.

Appendix 2

Notes on the nature of the Traprain Law site and the significance of the new assemblage specifically relating to determination of the site purpose in the region. These are noted here as observations which might be useful to others research.

The site of Traprain Law ultimately was/is significant in regard to the wider region of East Lothian, both in terms of its situation and involvement within localised systems historically and in terms of modern archaeological study of site typologies and dynamics. Traprain Law is a clear site of focal power in the region, this is evidenced perhaps most clearly in the Iron Age to Roman period with the clear product exchange involvement of the site with Roman cultural settlements. Various excavations of the main Traprain Law summit site have recovered items with clear Roman cultural association, these have included the Traprain Law silver hoard, but also more mundane high-status items such as fragmentary or bead-form Roman glass and the archetypal Samian ware. This is an exchange connection between a native settlement and representatives of the Roman culture, which can occur with such high-value artefacts only because the native settlement, in this case Traprain Law, is also deemed high-status. This is a relatively widespread trend between Roman sites and high-status British sites, commonly acknowledged throughout Iron Age Britain, the exchange of cultural items is often associated with diplomatic agreements between the two groups (Hingley: 2005). This proves the significance of Traprain Law to the region, it is this site which negotiated and created diplomatic attachment to a 'new' culture, which would influence local communities and eventually cause tensions amongst native communities within and outside the region. It has been noted that often these overtures of benevolent exchange were an intentional cover for the gradual Romanization of native culture and the creation of a relationship of reliance which would further bind native British existence to the Roman Empire, as a vassal state (Hingley: 2005). This is an extremely subversive method of control with Traprain Law acting as the ultimate 'gateway site' not only for negotiation but also further diffusion of Roman cultural ideals into local communities. Fragments and bead-forms of Roman glass and Samian ware sherds were recovered from a number of Zone 1 sites including Phantassie, Knowes and Standingstone. Traprain Law influenced local communities culturally through diffusion of Roman-associated cultural items into trading circulation, this probably also had a political impact on localised mindsets in regard to sustained Roman presence in the region. It also probably curated a new rubric for concepts of identity and societal hierarchies, with Roman-associated items becoming indicators of higher societal status. In this regard the socio-cultural significance of Traprain Law is demonstrable, particularly with (Zone 1) satellite sites directly situated within the environments surrounding Traprain Law. Not only was Traprain Law the deciding power for the region, its mouthpiece in diplomatic relations but also a 'gateway' for cultural diffusion, not only in terms of Roman cultural idioms but also the tenets of native British lifescapes. The relationship between Traprain Law and these (Zone 1) satellite sites is directly comparable to that which Roman representatives constructed between the Empire and Traprain Law, indicators certainly exist for a vassal state system. There is for example limited evidential basis for Traprain Law having a direct role in the arable agricultural taskscape which dominated local landscapes, the summit site demonstrates no significant evidence of cereal processing residues or long-term storage of cereal products. Yet, the main Traprain Law summit site was quite obviously supplied with cereal products for subsistence, the suggestion being that this resource was locally sourced from (Zone 1) satellite sites which were 'overseen' by Traprain Law. In this regard, Traprain Law is significant as potentially a controlling power in the region or as a community with heightened local responsibility, whether this is recognised in an administrative capacity or in terms of resource defence from outside systems. The significance of Traprain Law quite obviously pre-dates Roman interference in the region, and even the Iron Age construction of somewhat monumental defensive features i.e. ramparts on the summit site. There is evidence that from the Neolithic through to the Bronze Age Traprain Law stood at the centre of a ritual landscape which included the Zone 1 sites of Knowes, Pencraig Hill, Pencraig Wood, Overhailes and the Zone 2 sites of South Belton, Eweford West and Eweford East. The importance of Traprain Law within the region has a long historical basis, the early ceremonial association of the site would have fixed it within the local memoryscape as a space to be respected and caused it to become a focal point for local concepts of identity and 'belief'. This would have sustained the site with inherited power even when ritual practices became secondary at the site to mundane occupation taskscapes. Traprain Law outlasted all of the local ceremonial sites previously mentioned and retained some aspects of ritual practice, the 'Pond/Tank' feature for example which holds contexts associated potentially with ritual depositions.

Traprain Law would continue to have strong spiritual 'belief' associated with it even into the later Medieval period, when structures related to a Christian burial were constructed on the summit site. The site of Traprain Law is significant because it has sustained local communal ceremonial focus, a factor which undoubtedly secured the site status and made it an integral constituent to the shared experiences of 'religion' in the region. The area in which Traprain Law is situated, which may be a contributing factor of its foundation, is geomorphologically inclined to landscape dominance and environmental prosperity. The association of Traprain Law, the Zone 1 and Zone 2 sites with situation on or peripheral situation close to the East Lothian coastal plain predisposed communities to potential high agricultural productivity, this area is enclosed by upstanding reliefs of igneous rocks almost in every direction. At the centre of this high potential agricultural land is situated the intrusive Laccolith of Traprain Law, as one of the only points of high elevation it is perfectly situated for visibility of what would become coveted agricultural fields. Traprain Law was significant to the region because it dominated visibility and provided the optimum situation for a point of control over local resources. From this elevated point in the landscape the various systems of the larger taskscape would have been constantly observable, with any threats to the integrity of these systems or indeed resource supplies also visible. It is a comment often made in regard to human survival in adverse conditions, in many 'survival manuals', that it is useful to attempt to gain elevation in order to more easily observe surrounding environments and inventory potential sources of products valuable to continued survival. From its situation Traprain Law not only dominated surrounding environments it controlled and orchestrated the resource extraction and management systems associated with the environmental contexts. Traprain Law is a site with consistent evidence for the use of primary products without the associated extraction or processing residues or signs, this is the case as already discussed for cereal products but also for wood resources. There is significant evidence to suggest that local secondary woodland was managed through coppicing practices, this is affirmed by ring-count data from Phantassie (*Corylus avellana* – 12yrs) and Traprain Law (Various – 2-9yrs). The palynological profile for Traprain Law however suggests that the site was relatively distant from sizable secondary woodland environmental contexts, instead the site was surrounded by an open agricultural landscape. This is despite the apparent Traprain Law monopoly on wood resources as a fuel source, as many other sites appear to be dominated by other often less efficient fuel resources i.e. turves. Traprain is significant in the region because it appears to have this control or monopoly over resources despite there being limited indication of the community having direct involvement in extraction processes. The status of Traprain Law is equally dependent however on the intentions of the local (Zone 1) satellite sites, and to some extent the purpose of the main Traprain Law summit site is also determined by the demography to which it is responsible. The extent of the permanence associated with the Traprain Law summit is highly debated, the resident community there could potentially have been highly seasonal or temporary and determined by changing socio-political dynamics, with a reduced resident community acting as 'caretakers' when the site was not required. Instead of a permanently occupied residential site the purpose of Traprain Law may have been specialised, as a place of exchange or a space of diplomatic relations and dispute negotiation, coming into use when needed. It is interesting to consider that Traprain Law may be comparable to a collaborative community project, owned by the satellite communities it could also potentially have controlled. The significance of Traprain Law within the region of East Lothian is unarguable, its purpose and the balance of control however sustains debate.

It is in this diversity of potential purpose that Traprain Law is significant particularly in relation to the only other hillfort site examined in this study, Broxmouth. The two sites despite having the same associated descriptor of site typology are fundamentally dissimilar to each other. Broxmouth in many ways is the archetypal hillfort site of Lowland Scotland, it is a substantial Iron Age site of enclosed occupation with notable defensive structures and considerable midden deposits. Successive activity at Traprain Law pre-dates the Iron Age, although the later Iron Age to Roman period is when domestic occupation of the site occurs, this site is enclosed but not extensively and despite defensive features being evident at the site these do not demonstrate long-term maintenance, the midden deposits at the site despite there being deep-stratigraphies of use are minimal, suggesting that occupation of the site was not population dense, in fact it could be described as residual during the Iron Age. Broxmouth is a site which saw extensive development and high population densities during the Iron Age, Traprain Law in contrast sees an absence during this period of large-scale domestic activity. Traprain Law is a significant site because it demonstrates the true complexity of hillfort site typologies, Traprain Law is a hillfort however it is also a site which has status that isn't associated with being a domestic occupation site, it was a communal centre, a place of religious significance, a place for collaboration and political negotiation for otherwise independent communities. That is not to diminish the status of the Broxmouth site, it is only to highlight how differently these spaces were potentially used by communities. The new Traprain Law data is significant because the data absences within the assemblage have highlighted these differences between hillfort sites and acknowledged the diversity of socio-communal systems within the same East Lothian region. In this regard the absences within the Traprain Law data have inherent value as the lack of activity they demonstrate changes the way the purpose of Traprain Law is interpreted. Of course, it is not only data absences which make the new Traprain Law data significant but also its data contribution. The palynological report for example has revealed a local environmental history which places all the sites in constituent vegetational communities and allows developed discussion of how site interactions affected environments. Revealing obvious clearance trends and maintenance of open arable agricultural landscapes, later, secondary woodland regeneration is allowed to occur in peripheral 'buffer zone' ruderal communities. The maintenance of environments is made clear by the relatively stable palynological trends with vegetation populations not particularly dynamic. Sites within the Traprain Law region, those in Zone 1 and Zone 2, valued and maintained the open arable agricultural landscape that many of these same communities were instrumental in forming. This is significant because it suggests the existence of a collaborative environmental management and maintenance system which existed apart from agriculturally associated tasks, it included the management of secondary woodland environments (coppicing – as demonstrated by the charcoal assemblage) and was resource-optimization focused. This is an aspect which the new Traprain Law data highlights which would have been previously neglected as community-environment interactions are hard to reconstruct, particularly with limited proxy data available as at Traprain Law. What is also clear from the new contribution of the Traprain Law data is that local communities were committed to high productivity arable agriculture, that management and enrichment practices did occur, the nitrogen $\delta^{15}N$ values suggest low-nitrogen materials may have been used in sediment supplementation i.e., terrestrial manure or midden waste. It has already been established that agriculture in the Traprain Law environs (Zone 1) was probably a cohesive effort, midden waste from Traprain Law may even have supplemented local arable fields, this new data confirms the nature and extent of community collaboration towards aims of high productivity. The Traprain Law $\Delta^{13}C$ values associated with the cereal assemblage suggest that artificial irrigation to provide arable produce with sufficient water resources for growth was not in place within the Traprain Law environs (Zone 1), just as $\delta^{15}N$ values confirm only low-nitrogen material supplements were employed. This indicates that whilst the Traprain Law agricultural system was to some extent optimised, it was not an infallible system as it allowed for water stress in arable produce. The region is not necessarily naturally optimal for arable agricultural production and the communities within the Traprain Law environs (Zone 1) knew how to best amend these natural characteristics to develop the most reliable and productive agricultural system possible within the boundaries of their communal capabilities. The new Traprain Law data is significant in relation to the Zone 1 and Zone 2 sites because it confirms their identity as effective agriculturalists, with a profound knowledge of the qualities of their local environments. There is here evidence of a deep connection based on reliance not only inter-communally but also between these communities and their environmental situation, this is a ceremonial landscape which became a lifescape dominated by arable agricultural calendars, these cannot be unconnected in communal memoryscapes. Alternatively, perhaps this connection is based on the knowledge that these communities from foundation aided in the curation and maintenance of the Traprain Law open landscape, in that fact alone rests a significant amount of environmental responsibility. The picture of Traprain Law and related sites is not drastically affected by the addition of this new data, it is still a hillfort site surrounded by a number of smaller agrarian communities. However, the interpretation of the relation between these communities and the outward interactions between them and with environmental contexts is found to be much more complex and dynamic as a result of this contribution.

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