

Mesolithic Consultation Draft

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Introduction

The onset of the Holocene at c.9800 cal BC marks the commencement of the Mesolithic period with the earliest radiocarbon date for Mesolithic hunter-gatherer-fisher activity in Scotland currently 8630±290 cal BC [9250 ± 60 BP; OxA-10180] from [Cramond](#) on the Firth of Forth (Saville 2008). Defining the end of the period is more complex with overlaps in radiocarbon dates for the Mesolithic and Neolithic existing across Scotland (eg see Ashmore 2004), however, for the purposes of this Framework the transition is recognised as commencing from 4000 BC, as defined by the Scottish Archaeological Periods and Ages (ScAPA) project. The search for evidence of the hunter-gatherer communities of Perth and Kinross remains a relatively new endeavour with great promise demonstrated through investigations by the Ben Lawers Historic Landscape project, Strathearn Environs and Royal Forteviot (SERF) project, and most recently the *Early Settlers* project of the Tay Landscape Partnership Scheme (TayLP). Our current understanding of this period derives from palimpsest pit sites, lithic assemblages and stray finds with the exploitation of locally sourced raw materials of the chalcedony family (chalcedony, agate, jasper and carnelian) for tool manufacture being a notable regional characteristic of the known Mesolithic. Although few in number, the known sites and assemblages have contributed significantly to our understanding of transient hunter-gatherer communities and their activities along the Lowland postglacial shorelines of the Rivers Tay and Earn and in Upland areas by Loch Tay, however, evidence for activity between these environments remains elusive. The projects undertaken evidence considerable future research potential, emphasising the value of applying refined fieldwork methodologies to carefully targeted investigations as a means of increasing site identification, excavating the sites and investigating their internal organisation, and improving artefact recovery.

This chapter provides a regional overview for the Mesolithic in Perth and Kinross as we currently understand it. Following a chronological progression, consideration is first given to the Late Upper Palaeolithic, the current absence of material evidence from this period across the region and what activity might look like should it come to light through future research. The overview includes a brief history of archaeological research undertaken in the region and a more detailed assessment of the current resource. The research agenda provides recommendations for further work in the form of research priorities and questions.

Main Periods	Sub-Periods	Cal BC
<i>Mesolithic</i>	<i>Late Mesolithic</i>	8,400–4,000
	<i>Early Mesolithic</i>	9,800–8,400
<i>Late Upper Palaeolithic (LUP)</i>	<i>Ahrensburgian</i>	10,800–9,800
	<i>Federmesser-gruppen</i>	12,000–10,800
	<i>Hamburgian/Creswellian</i>	12,700–12,000

Table 1. Basic chronological schema for the Late Upper Palaeolithic and Mesolithic periods of Scotland (cal BC). The dates are mainly based on dates from the various Scottish research framework (ScARF) panel reports (Saville and Wickham-Jones 2012; Brophy and Sheridan 2012; information relating to the LUP Sonia Grimm pers. comm.).

Regional Overview

The Late Upper Palaeolithic (LUP)

So far, no sites, assemblages or stray finds from Perth and Kinross have been dated to the LUP, but considering that certain or likely material from this period has now been reported from most other parts of Scotland, it can only be a matter of time before finds from this period are made in the area. As shown in Table 1, the LUP consists of three sub-periods, namely the *Hamburgian* (12,700–12,000 cal BC), the *Federmesser* period (12,000–10,800 cal BC), and the *Ahrensburgian* (10,800–9,800 cal BC), each of which is defined by a set of typotechnological attributes reflected in the material culture, most importantly as different forms of arrowheads (Ballin 2017). To date, the LUP in Scotland is recognised, and dated, solely on the basis of significant lithic types.

The Scottish *Hamburgian* is best known from [Howburn Farm](#) in South Lanarkshire (Ballin *et al.* 2018), where several thousand artefacts (probably of Doggerland flint) were recovered, including many asymmetrical Late *Hamburgian* tanged points of Havelte type (a sub grouping). On the west-coast a *Federmesser* period site, characterised by plain backed points, was discovered at [Kilmelfort Cave](#) near Oban (Saville and Ballin 2009). Stray small *Ahrensburgian* tanged points have been recovered from the Loch Torridon/Inner Hebrides area (Ballin and Saville 2003), and a site from Islay may also date to this period (Mithen *et al.* 2015). A single-edged point and several small tanged points from Orkney indicate a LUP presence here (Ballin and Bjerck 2016). Two sites from eastern Scotland are also likely to be of a Paleolithic date, characterised by unusually large blades (Long Blade industries; Barton 1998) which may suggest an *Ahrensburgian* date (Ballin 2019; forthcomingA). And sites along the Dee have yielded several probable LUP flint artefacts (Ballin and Wickham-Jones 2017). There is therefore no doubt that Scotland was settled, albeit thinly, and possibly not continuously, over the later part of the Palaeolithic.

The key to understanding where LUP sites may be expected lies in the subsistence economy of the Palaeolithic groups and their high mobility. Obviously, groups on the Scottish west-coast and that region's islands must have exploited marine resources, and fishing is thus likely to have been part of the area's economical strategy. However, the people of this period are generally defined as being highly mobile, and primarily known to have exploited the migrating herds of reindeer which they followed and hunted across the steppes of the north European Plain, across Doggerland and up into what is now the Scottish mainland.

In order to consider the possibility of LUP sites in Perth and Kinross, it is useful to examine the known locations of LUP sites and findspots in southern and eastern Scotland. These sites are generally found in connection with rivers, such as the Tweed (Howburn Farm is located in the gap between the Tweed and the Clyde), the Dee and the Lunan. Rivers such as these are likely to have been important for many reasons: they facilitate travel and thus access into the Scottish hinterland, and are also likely to relate to the migration routes of animals such as reindeer funneled along river valleys. Rivers and their valleys, such as the Tay, the Earn and the Isla, within the area of interest, would have provided varied resources and ecozones (regarding shelter etc).

With regard to site survival, identification of such early remains is problematic. In many places LUP activity has left little archaeological footprint, and there is an increasing recognition that the signature of exploratory and colonizing activity such as this will be light. In addition, active geomorphological processes have served to obscure the record. In particular, the submergence of the Main Holocene Transgression has impacted on many of the lower fields along the present Tay estuary, meaning that shoreline sites from the earlier Mesolithic and LUP are likely to have been disturbed and redeposited, as indicated by waterrolled lithic artefacts from lower levels along the estuary (Nicol and Ballin 2019; Dawson *et al.* 2014). This suggests that, in the general Tay area (including its tributaries), it may be more fruitful to search for sites dating to this period further inland, on raised terraces along the waterways or around the shores of lochs (Howburn Farm type sites) which were the places in the landscape favoured by northern German and Danish LUP reindeer hunters (eg Rust 1937; 1958; Holm and Rieck 1992). Research into this latter category should consider changes brought to the present countryside by agricultural drainage and other land schemes since the eighteenth century which have led to many ancient watercourses disappearing.

The Lowland Mesolithic

As the Tay estuary gradually cleared of retreating ice from the Late Devensian glaciation around 15,000 years ago, access to the emerging landscape of Perth and Kinross and its natural resources began to open up for hunter-gatherer communities. The earliest dated Mesolithic activity comes from a pit alignment at [Wellhill](#), Dunning which suggests that transient groups were successfully navigating up the River Earn into Strath Earn from the Tay estuary during the Late Mesolithic (Wright and Brophy forthcoming). Wellhill is situated c.1.5km south of the Main Postglacial Shoreline and sufficiently inland to indicate that early hunter-gatherer activity extended beyond coastal subsistence camps near the estuary. Although no lithic artefacts were recovered from Mesolithic contexts, radiocarbon dates of 8205 and 7525 cal BC indicate that activity was broadly contemporary with the Mesolithic pit alignments at Stonehenge, Wiltshire and [Warren Fields](#), Aberdeenshire (see Pollard 2017: 176 for discussion on the chronological connection between Stonehenge and Warren Fields). At c.40m OD, Wellhill is considerably higher than the maximum of the Main Holocene

Transgression, a rapid rise in sea level estimated at between 9 and 12m (Dawson and Cressey 2010; Dawson *et al.* 2014: 15) that occurred towards the end of the Mesolithic period around 5630–5440 cal BC (Ballantyne and Dawson 1997: 39) and which has been suggested could have destroyed evidence of earlier Mesolithic activity (Dawson *et al.* 2014: 18; Nicol and Ballin 2019:13). Wellhill therefore demonstrates the potential for early Mesolithic material to survive at higher elevations and in non-coastal contexts but still within close proximity of the shore. Further promise for inland discoveries is indicated 4km west of Wellhill at Forteviot where carbonised material found in Neolithic-Bronze Age and Early Medieval contexts has produced four Late Mesolithic radiocarbon dates ranging from 7510 to 6680 cal BC (Brophy and Noble 2020: 113).

The extensive lithic assemblage discovered at Freeland Farm (MPK20049) as well as indications of Mesolithic activity from assemblages at Pitroddie and East Inchmichael Farm (Nicol *et al.* 2019: 13) offer the first detailed insights into the activities, material exploitation and lithic technology of the hunting, gathering, fishing communities that operating along the shores of the Tay estuary in the later part of the Mesolithic (8400–4000 cal BC). The linear spread of lithic debitage, cores and tools parallel to the southern bank of the Main Postglacial Shoreline at Freeland Farm provides the first confirmed evidence of a coastal settlement in the region. Such a position would have provided the transient community with access to multiple biotopes, namely the water for fishing, fowling, shellfish gathering and hunting marine mammals, and the coastal hinterland for general hunting and gathering (*ibid.*: 32). Notable too at Freeland Farm is the wealth of information that the assemblage provides for lithic raw material procurement, core preparation and tool production activities. The evidence indicates that jasper/carnelian geodes, sourced from local igneous rock, was the predominant material exploited for the manufacture of diagnostic late Mesolithic tools types such as microblades, microburins and burins (*ibid.*: 30). Further east and on the northern shore at Pitroddie and East Inchmichael Farm in the Carse of Gowrie, the situation is slightly different with chalcedony and agate found to be more common within the assemblages than jasper/carnelian (*ibid.*: 35), an arrangement comparable to the Mesolithic community at [Morton](#) in the Tentsmuir area of Fife where chalcedony was used extensively alongside flint (Coles *et al.* 1971). The exploitation of jasper/carnelian is an important regional distinction which may prove to be a very localised signature of the coastal communities along the Tay estuary and a diagnostic trait of the Mesolithic period in this area (*ibid.*). Whether the distinction occurs for entirely pragmatic reasons such as material availability remains open for discussion, however, Nicol and Ballin suggest an appealing interpretation that the brown colouring of the jasper/carnelian had particular meaning to the communities of the Tay as a visual symbol of social identity, as black pitchstone may have had on Arran in the Firth of Clyde, green bloodstone on Rum in the Inner Hebrides (*ibid.*: 39) and indeed quartz may have done in the Uplands of Perth and Kinross.

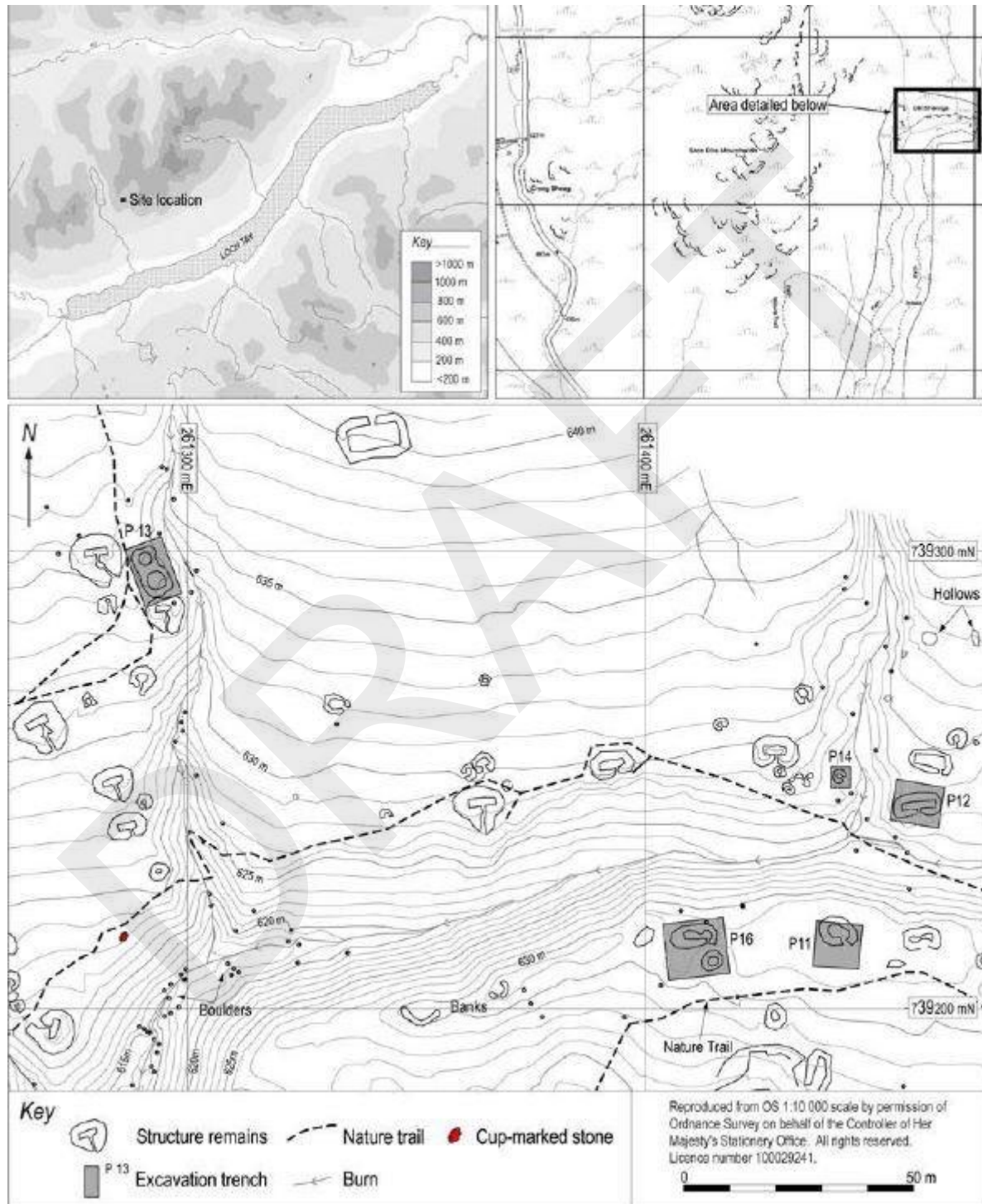
Finally, a single microburin is noteworthy here for its discovery south of the Ochil hills at [Kilmagadwood](#) near the shore of Loch Leven in Kinross-shire. This example was one of one of 34 chipped stone artefacts recovered during community field-walking in 2018 (Engl 2018).



The Upland Mesolithic

Although the main concentration of lithic assemblages have been found along the banks of the Tay estuary to date, the region's earliest known evidence of lithic reduction activities derives from the Uplands, an altogether unusual arrangement for Scotland where the Mesolithic has traditionally been considered a coastal phenomenon owing to the rich evidence from the islands and the west coast (Finlay 2016: 27). The site at [Edramucky Burn](#) on the northern side of Loch Tay demonstrates that hunter-gatherers were reaching far beyond the Tay estuary and navigating the main watercourse up past primary forest-clad shores to the river's source around 7200–6700 cal BC (Figure 1). The assemblages from Edramucky Burn indicate extensive lithic raw material procurement, preparation and tool manufacture using locally sourced quartz types, with artefacts made of coastal flint, including a possible scalene-triangle microlith, suggesting that the hunter-gatherer groups arrived with pre-made flint tool kits which they augmented using the local resources (MacGregor and Toolis 2016: 16). These groups carefully selected their Upland camps with freshwater supplies and environmental evidence for scrub-woodland resources nearby to exploit. The site is situated atop a prominent moraine bank c.630m above sea level with commanding views of the surrounding landscape making for an ideal hunting-stand (*ibid.*). The Edramucky Burn site also stands at the foot of an important terrestrial routeway between Loch Tay and Glen Lyon suggesting a possible further use as a transitory camp which would have taken these early settlers deeper still into the northernmost Upland Glens of Perth and Kinross (Finlay 2016: 27). Although considered a lower quality material (although some quartzes

have excellent flaking properties), the caching of quartz nodules in a pit supports the argument for intermittent or seasonal use by groups returning to favoured locations (MacGregor and Toolis 2016: 16) which it has been suggested they could have taken on additional social meaning for the enactment of non-subsistence-orientated rituals such as initiation, seclusion, or for instruction over the course of time (Finlay 2016: 27).



From the known evidence, the region's Mesolithic communities would appear to have focused their activities along the estuarine coastline using the River Tay and its major tributaries, such as the River Earn, as conduits for travelling more deeply from the Lowlands to the Uplands on a seasonal basis. Pollen records from Black Loch near Grange of Lindores in the Ochils (Whittington *et al.* 1991) and the submerged woodland west of [Craggantoul](#) (MPK 17641) in Loch Tay (Dixon 2016: 10) suggest a landscape shrouded in dense forests where striking natural landmarks such as the scarps of Moncreiffe Hill (at the confluence of the Rivers Earn and Tay) and the Highland Summits of Ben Lawers and Meall nan Tarmachan (either side of the pass at Edramucky Burn) would have been key navigational markers to camps of increasing cultural meaning and significance. Samples from the submerged tree remains near Craggantoul returned a wide range of radiocarbon dates, including five Late Mesolithic dates, one for pine, one alder and three oaks (Dixon 2007, 162-3). This important site could have potential for developing long native tree-ring chronologies for Perth and Kinross, for archaeological dating, woodland characterisation, climate science and other overlapping environmental objectives (Mills 2021). It is noteworthy that all the sites where Mesolithic events have so far been confirmed are palimpsests with early Neolithic settlement activity also present. Evidently as communities began to settle, it is these places where mnemonic linkages to the landscape and exploitation of terrestrial resources were already established that became the platforms for more sedentary human activity.

The Complete Territory of the Mesolithic Groups of Perth and Kinross

While the remit of the current document is the modern administrative area of Perth and Kinross, it should be borne in mind that prehistoric hunter-gatherer territories tended generally to be defined by topography, such as mountain ranges and, in particular, waterways. As a result, any discussion of prehistoric territories based on modern administrative borders will be truncated and flawed. Waterways would generally work in one of two ways, namely as a territorial border or the focus of settlement. The deep fjords of Norway tended to separate neighbouring territories (eg Bergsvik and Bruen Olsen 2003, Fig. 52.6), whereas the Danish fjords (which are actually lowland estuaries) were the focus of settlement, with one social group inhabiting both sides of a fjord, from the sea and well into the hinterland (Vang Petersen 1984, Fig. 15).

One model would see hunter-gatherer territories along the Scottish east-coast defined geographically like the contemporary Danish territories, focusing on a firth or estuary and extending from the Sea, along the shores of the estuary, and into the upland and highland areas touched by the river-system, which in this region would first and foremost be the River Tay. Two aspects of this territorial (subsistence) system have already been mentioned, namely the inner estuary and the upland/highland area further west, however, the territory would also have included the mouth of the estuary and the North Sea coast on either side. This part of the territory forms part of a neighbouring, modern administrative region and therefore is not dealt with in detail here but is mentioned as the sea would have represented an integral part of the territories exploited by the Perth and Kinross communities, utilising the River Tay and its estuary to access additional food resources in the form of (salt water) fish and marine mammals (eg seals and whales).

The Tentsmuir area in Fife, immediately south of the estuary's mouth, is rich in Mesolithic remains, but only one site has been excavated, namely Morton (Coles 1971). This coastal site yielded a rich lithic assemblage from the early as well as the Late Mesolithic periods,

much of it chalcedony. The extensive use of chalcedony may link this site to the communities living along the Tay river and estuary.

Midden remains included evidence of the exploitation of terrestrial mammals (eg red deer, roe deer, aurochs, and wild boar), birds (in particular guillemots and gannets), fish (dominated by cod, but also including haddock, turbot, sturgeon and salmon or trout), and marine molluscs (an impressive variety of species, with Baltic tellin being the most common [*macoma balthica*]). Morton also yielded a large variety of Early and Late Mesolithic tool forms, for example including relatively large numbers of isosceles as well as scalene triangles.

Morton A (identified by diagnostic lithic artefacts as Early Mesolithic) returned one Late Upper Palaeolithic date and several Late Mesolithic dates covering the period 8000–4200 cal BC, whereas Morton B (identified by its lithic assemblage as Late Mesolithic) returned Late Mesolithic dates covering the period 5650–3790 cal BC, or generally slightly later than the dates from Morton A. However, there are indications that re-examination and re-classification of the assemblage is desirable, ideally alongside the lithic assemblages from the rest of Tentsmuir that are held in the collections of NMS and local museums including Perth. The number of burins (101 pieces) for example, is exceptionally high, considering that Scottish Mesolithic sites tend to include none or single-digit numbers of such pieces. Unfortunately, this task is hampered by the fact that the finds have been allocated to a number of different museums.

History of Research in Perth and Kinross

The history of Mesolithic research in the region is short. It could be argued that chance discoveries of individual lithic artefacts or assemblages from the beginning of the 20th century form the earliest recorded investigations. However, following re-examination by Wright (2012) the majority of these finds are either non-diagnostic to any prehistoric archaeological period or can be typologically categorised as having Neolithic or Bronze Age origins.

The Ben Lawers Historic Landscape project 1996–2005 (Atkinson 2016), led by the Glasgow University Archaeological Research Division (GUARD), therefore represents the first formal archaeological research project to identify Mesolithic activity in Perth and Kinross and notably also the first in Scotland from an Upland context (Finlay 2016: 27). The SERF project (2012–17) followed with its excavations at Forteviot, Wellhill and Millhaugh yielding Mesolithic dated material (Forteviot), pits (Wellhill) as well as comparable pit features (Millhaugh) on the shores of the river Earn. To date, the Tay Landscape Partnership (TayLP) *Early Settlers* project (2014–17) remains the only investigative work dedicated to identifying Mesolithic activity that has taken place in the region (Nicol and Ballin 2019; Ballin and Nicol 2017). It was developed by Perth and Kinross Heritage Trust in response to the lack of known sites within the area (David Strachan pers comm) and during development of the TayLP *Early Settlers* fieldwalking programme, the Trust commissioned two reports on the area which in themselves represent valuable research contributions. Wright (2012) produced a comprehensive assessment of known lithic artefacts and assemblages held in museum collections that were attributed to the Mesolithic period, while Dawson, Duck and Young's 'Ice Age to Modern Coastline' report (2014) conglomerates geomorphological and

stratigraphic studies with radiometric dating to provide a detailed synopsis of relative sea level changes in the Broad Valley Lowlands of the River Earn and the Firth Lowlands of the River Tay since deglaciation occurred around 14,000 years ago. Digital mapping of the Main Postglacial Shoreline at its maximum inundation forms part of this work and provides a significant resource for informing regional Mesolithic research and targeting fieldwork. It is noteworthy that since the successes of '*Early Settlers*' along the rim of the MPGS, efforts are being made to place fieldwalking conditions on development work in this area which, if successful, will increase the opportunities for Mesolithic discoveries in the Firth and Broad Valley Lowlands going forward. The recent publication of guidance on the investigation and management of lithic scatter sites in Scotland by the Association of Local Government Archaeological Officers (ALGAO) which sets out the significance of scatters and presents technical best practice is a welcome addition to maximising any future developer-led opportunities (Wickham-Jones 2020).

The Extant Resource

The existing record for Perth and Kinross's earliest hunter-gatherer communities, as we currently know it, remains minimal. Period assigned entries in the Perth and Kinross Historic Environment Record currently consists of 31 sites and monuments, 26 of which relate to chance discoveries of individual lithic artefacts or small assemblages. A commissioned investigation of these lithic assemblages in 2012, including those accessioned at the National Museum of Scotland and Perth Museum and Art Gallery, failed to identify any as being unequivocally Mesolithic in either form or date (Wright 2012). There are only 4 recorded sites associated with domestic or lithic working activity, 1 of which refers to an area of fallen trees and stumps near Craggantoul, to the south of Balnahanaid in Loch Tay - a remarkable preservation and highly informative discovery indicating the presence of a woodland on the edge of the loch from the 9th Millennium BC to the 6th Century AD when the water level was 4-5m lower than it is today (Dixon 2016: 10). LUP and Mesolithic settlement evidence, which includes both robust dwellings and more ephemeral shelter and wind-break structures, remains elusive across the region. Examples occur close at hand between the Tay and Forth estuaries providing evidence of both multiple (Morton [Coles 1971]) and individual ([Fife Ness](#) Wickham-Jones and Dalland 1998]) structures. These sites suggest that although currently absent from the known resource, there is a high likelihood that similar structures would have been present in the Perth and Kinross area and that archaeological evidence of them remains to be found.

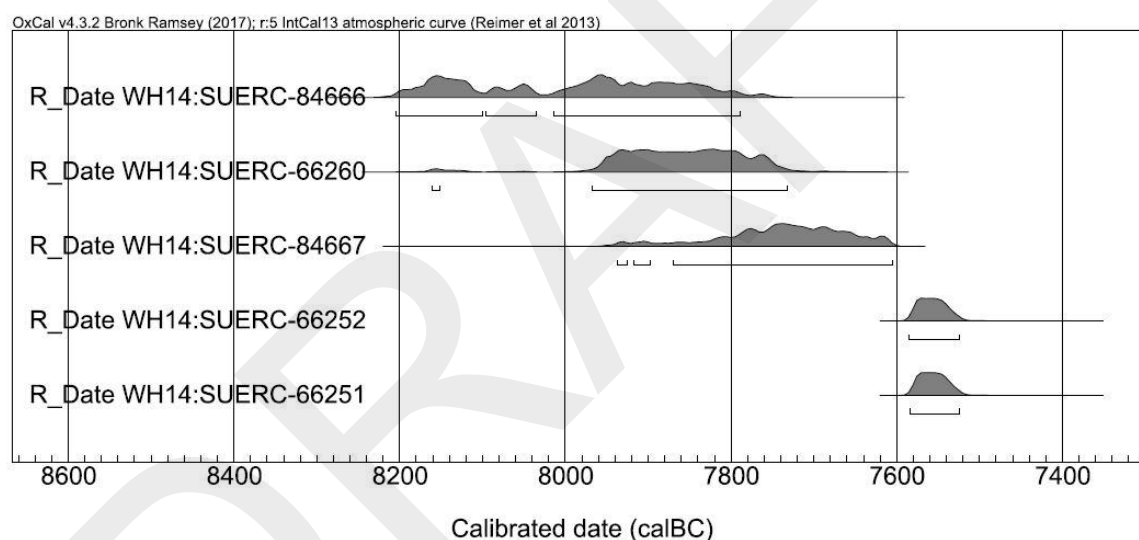
Pits

At the time of writing current ongoing research across Scotland has identified 166 radiocarbon dates from 48 Mesolithic sites (Wright and Brophy forthcoming). These pits can be categorised as:

1. Pit alignments;
2. Dwelling structures with associated pits where lithics and carbonised assemblages have been recovered;
3. Pit(s) with recovered lithics and carbonised material; and
4. Pit(s) with carbonised assemblage.

The only known radiocarbon dates from pits in Perth and Kinross are from Edramucky Burn, Ben Lawers (category 3), and Wellhill, Dunning (category 1). A radiocarbon date of 7200–6700 cal BC (8045 ± 55 BP; OX-A-9867) was obtained from willow charcoal recovered from a single pit at Edramucky Burn which also included an assemblage of quartz flakes, nodules and small fraction debitage interpreted as material from a seasonal camp that was buried as a cache intended for use on a return visit but never recovered (Atkinson 2016: 15; Donnelly 2016: 15; Finlay 2016).

The SERF excavated alignment of ten pits at Wellhill, Dunning [8205–7525 cal BC; were distinctive in plan due to their outer ring appearance and defined as ‘halo’ pits. An L-shaped ditch was also recorded which may have been from a weak, self-supporting windbreak. A similar ‘halo’ pit was excavated by SERF at the scheduled multi-period site at [Millhaugh](#), Dunning, however, no Mesolithic dating evidence was obtained. A residual backed bladelet of flint, recovered from a late Neolithic post/posthole has been suggested as indicating a possible Mesolithic presence (Wright and Brophy forthcoming) though it should be noted that backed bladelets are not as strictly Mesolithic as geometric microliths like isosceles and scalene triangles, trapezoids and crescents.



OxCal v4.3.2 multi-plot (Bronk-Ramsey 2017) of radiocarbon dates from Wellhill.



Aerial photograph (B79132) of the scheduled pit alignment at Wellhill (Canmore ID 84910; Site number NO01NW 75; Index 8918; NGR NO 02566 15733). © RCAHMS/HES.



Three of the 'halo' pits at Wellhill. © University of Glasgow

Material Culture: Lithics

Lithic assemblages are a significant archaeological resource and represent a core source of information for understanding Scotland's earliest settlers (Wickham-Jones 2020: 10). Scatters can often be the only indication of past human activity, provide evidence for more complex depositional practices and include material from different periods which is key to understanding how a site has been used over time (*ibid.*). Lithic scatters are the dominant form of material culture available from the Mesolithic period in Perth and Kinross and represent the primary evidence for hunting, gathering, fishing and transitory camps in both the Lowlands and Uplands. In the Uplands at Edramucky Burn, local quartz has been found to dominate the assemblages with five main types exploited. The largest singular assemblage, some 988 pieces, came from an occupation floor interpreted as a primary knapping location and near a pit containing a cache of quartz nodules. Blades, cores and flakes comprise the bulk of the assemblages but none, other than one possible microlith fragment, were diagnostic (*ibid.*: 13 and 15). The recovered flint was of a wide range of colours, and evidenced the importation of pre-made tools to the site with subsequent retooling episodes. The finds included a possible microburin, a retouched flake resembling a scalene triangle microlith and a backed bladelet (*ibid.*).

The multi-period assemblage from Freeland Farm (707 lithic artefacts) is dominated by Late Mesolithic evidence (8400–4000 cal BC), in particular the exploitation of local jasper/carnelian for the production of microblades and tools. The tools include microliths and bladelets, scrapers, knives, burins and truncations, and a diagnostic microburin by-product from the manufacture of microliths was also recovered.

Considering the transition to more sedentary use of the site, local flint was found to characterise the early Neolithic material recovered and late Neolithic artefacts included use of exotic flint from north-east England (Nicol and Ballin 2019). Neolithic forms include a leaf-shaped point, scale-flaked knives and a truncated blade of Arran pitchstone. As shown in Ballin (2015; 2017) most Scottish mainland pitchstone found in radiocarbon-dated pits dates to the Early Neolithic, although a small number of pieces have now been recovered from radiocarbon-dated Mesolithic pits (Ballin, Ellis and Baillie 2018).

Northern shore assemblages along the River Tay estuary at Pitroddie and East Inchmichael Farm have continued to exhibit exploitation of jasper/carnelian in the form of flake debitage but to a lesser extent, with chalcedony and agate being the dominant materials recovered as debitage and short end-scrapers (*ibid.*: 13). A further, very small assemblage from the Scone Estate included a pitchstone conical microblade-core that most likely dates to the Early Neolithic (*ibid.*).

The extensive assemblage from Freeland Farm has allowed a late Mesolithic operational schema to be developed covering procurement, core preparation, blank production and tool production (*ibid.*: 30-31) which represents a significant step forward in understanding hunter-gather lithic technology and manufacture in the region. Based on the assemblage, Ballin and Nicol suggest that the schema focused on the production of microblades and narrow broadblades by the application of soft-hammer percussion, most likely pressure-flaking (*ibid.*: 37-38). The application of bipolar technique appears infrequently and it is argued that the flawed nature of jasper/carnelian made soft-hammer percussion more successful for the production of single- and opposed-platform cores as well as the blades/microblade (*ibid.*: 31).

Such variations to reduction strategies in response to the size and quality of available raw materials is seen across Scotland (Finlay *et al.* 2002:108). However, it seems that bipolar technique was less frequently used in eastern Scotland compared to western Scotland, such as at [West Challoch](#) [Canmore ID 352782], with a possible reason equating to the flint pebbles generally available in western Scotland being smaller than those found along the Scottish east-coast (Ballin forthcomingB).

In many respects, from procurement through to production, the use of jasper/carnelian appears to have created a notable local Mesolithic signature that is regionally distinct from contemporary sites on either Scotland coastline where flint exploitation is more dominant. Although parallels can be found on the west-coast where flint was locally supplemented by visually distinct raw materials including pitchstone, bloodstone and baked mudstone, at the time of writing the use of jasper/carnelian remains specific to the River Tay communities.

Research Agenda

This section presents the agenda themes for the Late Upper Palaeolithic and Mesolithic in Perth and Kinross. Some are nested under the **overarching PKARF theme headings** aimed at addressing wider multi-period priorities and others are **period-based** and specific to the scope of this chapter. Where appropriate, a short explanatory note is provided detailing underlying **period-based** thematic priorities which is then followed by the research questions generated to address them.

Environment

The Mesolithic environment of Perth and Kinross can only be described in general terms, and is poorly understood because of the relative paucity of pollen cores and related palaeoenvironmental research. Dawson *et al.*'s 'Ice Age to Modern' report (2014) provides a valuable synthesis of data relating to sea level change in the Tay Estuary as well as signposting to other relevant works such as Whittington *et al.*'s (1991) core sample studies at Black Loch near Grange of Lindores, Fife. Likewise, Dixon's (2016: 12) work in Loch Tay and Miller and Ramsay's (2016: 15) analysis of environmental samples from the lower slopes of Ben Lawers offer much needed data for reconstructing the Upland Mesolithic environment. The Late Mesolithic radiocarbon dates amongst the wide range of dates from the submerged tree remains at Craggantoul, Loch Tay (Dixon 2007) are a reminder of the potential of such sites in Perth and Kinross for developing long native tree-ring chronologies, as has been progressed for native Scots pine (*Pinus sylvestris*) elsewhere in the Scottish Highlands (Wilson *et al.* 2011), for past climate reconstruction, woodland characterisation and dating applications. The SERF project excavations around Dunning have provided additional environmental data, however, their surveys were unsuccessful in finding suitable water-logged locations for taking contiguous pollen core samples with sufficient depth needed to obtain data to characterise the Mesolithic environment. The surveys extended into the Ochils beyond the three parishes of the SERF project area but due to the rich, well draining agricultural soils of Strath Earn, remained unsuccessful in identifying suitable pollen core sites.

Priority 1: Information on the deglaciation of the area is needed. We now know that there was probably a Late Upper Palaeolithic presence in all parts of Scotland, from the *Hamburgian*, through the *Federmesser* period, to and including the *Ahrensburgian*. Understanding when and how deglaciation took place is key to determining where to look and therefore identifying LUP sites in the region.

Priority 2: The collection of environmental data for the immediate postglacial periods continues to be a high priority for reconstructing the Mesolithic landscape of the region, and therefore informing our understanding of how early settlers navigated, exploited and influenced it. Reconstructing ancient watercourses across the region is a particularly important element of this.

Questions:

1. How and when did deglaciation take place across Perth and Kinross?
2. Beyond the limited data sets that currently exist for the southern Tay estuary and Ben Lawers areas, what does the paleoenvironment of the region (including shoreline and inland vegetation) look like?
3. What were the ancient courses and levels of the region's rivers before and after the Main Holocene Transgression/at various stages of the LUP and Mesolithic periods?
4. What potential is there to develop prehistoric tree-ring chronologies in Perth and Kinross for archaeological dating, climate record and other environmental applications?

Upland/Lowland Relationships

Priority 1: No evidence of settlement structures has yet been identified in Perth and Kinross, however, Mesolithic dwellings have been found nearby along the Fife coast at Morton and Fife Ness, demonstrating the potential for similar structures to have existed in the region; efforts should focus on their discovery in both Upland and Lowland contexts.

Questions

1. How can we use the discoveries at Edramucky Burn and Freeland Farm to build new discoveries and help target future investigations to identify settlement activity in both the Uplands and Lowlands?
2. How can the potential of lithic scatter sites be realised to assist with the identification of settlement?
3. How do new site discoveries relate to existing Mesolithic settlement patterns from elsewhere in terms of features, site morphology, material culture and location within the landscape?
4. How can our understanding of the small Fife Ness type structures and the larger Howick type structures inform identification and interpretation of settlement activity in Perth and Kinross?

Periods of Transition

Priority 1: All of our currently known Mesolithic sites include later prehistoric activity. Understanding the relationships between periods of activity on these sites is a priority for appreciating the importance of places to people across chronological time spans.

Questions:

1. What is the relationship between Mesolithic and Early Neolithic sites?
2. To what extent can Early Neolithic sites assist with identifying Mesolithic activity in the region?
3. How can the dissection through excavation of apparent palimpsest sites into non-chronologically mixed zones improve our understanding of site biographies?
4. To what extent is Mesolithic material incorporated into later sites?

Pits and Pit Alignments

Priority 1: Examples of pits and pit alignment sites remain sparse across the region, identifying more of these and understanding how they functioned whether for subsistence, non-subsistence or a combination of both purposes is of importance.

Questions:

1. Is there a distinctive signature or characteristic of Mesolithic pits and alignments, such as the Wellhill 'halo' that could be used as a diagnostic for further site identification?
2. What are the relationships between pits/pit alignments and dwellings and lithic scatters?
3. What can we apply from examples found outwith Perth and Kinross that could better inform site identification and interpretation within the region?

Material Culture: Lithic Assemblages

Priority 1: The successes of fieldwalking projects such as the TayLP *Early Settlers* within the region and *Mesolithic Deeside* in Aberdeenshire (see Wickham-Jones *et al.* forthcoming) evidence the value and great potential of conducting systemic and targeted fieldwalking supported by detailed analysis. More work of this nature needs to be carried out through applied best practice, as recently set-out in '*Guidance for Investigating and Managing Lithic Scatter Sites in Scotland*' (Wickham-Jones 2020).

Questions:

1. Where are the region's other lithic scatter sites and how can the application of best practice and detailed analysis aid in their discovery?
2. What can further investigation and analysis of known lithic scatters in Perth and Kinross add to our understanding of LUP/Mesolithic activity in relation to shoreline camps, settlement and lithic reduction strategies?
3. How do new lithic assemblages from Perth and Kinross relate to previously examined lithic assemblages?
4. What range of activities do new lithic assemblages reveal about the subsistence activities of Mesolithic people in Perth and Kinross?
5. In terms of shared and distinct characteristics, how do subsistence activities of Mesolithic groups in Perth and Kinross relate to evidence found elsewhere in Scotland and more broadly in the UK and Europe?

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