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The terrain around Stirling at the Battle of Bannockburn 1314: Combined Scientific and Documentary Approaches to Reconstruction. I. The 'Low Road'.

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Abstract

Bannockburn is of immense importance in the Medieval histories of England and Scotland. Where the battle took place is still unknown, as is the terrain, what the place looked like. The two parts of this paper examine these problems by generating new data on environmental and land use reconstruction. The physical appearance of the landscape was reconstructed from radiocarbon (^{14}C) dating of landforms and palaeo-environmental analyses of sediment stratigraphies; new documentary evidence, specifically on the local environment and land use provided much detail. In Part I we analyse the early 14th century landscape of the 'low road' to Stirling, across the coastal plain. This has been mis-interpreted by historians less concerned than us with detail. We have re-defined the complexity of the coastal plain, emphasised its dynamism, identified natural hazards that may have influenced decision making by the combatants, including a new understanding of the Bannock Burn itself, debated with new evidence but not resolved key aspects of the land cover, and suggested a setting for the battle itself.

Keywords

Bannockburn; radiocarbon dating; environmental reconstruction

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Introduction

Disciplinary specialisms mean that reconstructions of the terrain around battlegrounds by military historians are often at variance with how those landscapes are understood by geographers and social, economic historians. Data sources familiar to the last disciplines remain unknown to or unexplored by the former. This is the case with the battle of Bannockburn, fought between the Scots and English near Stirling in central Scotland in June 1314. Understanding the terrain here is fundamental to understanding the battle. Now dominated by the city of Stirling, the topography is not complicated: low hills and small streams fall from the west to Stirling, and to the east is a large coastal plain (Figure 1a). The complexity is better seen in Figure 1b, a map of the superficial sediments ('drift' to geologists). Bedrock (in white) is sparse, in the hills and under Stirling Castle. The high ground to the west and south west is glacial till (pale blue: 'boulder clay'), largely impermeable but quite well drained, with ribbons of riverine alluvium (pale yellow). Patches of better drained sand and gravel (pink) line some streams. South and south east of Stirling Castle, the city expanded to St. Ninians and Bannockburn on well drained 'drift' left by high sea levels at the end of the last glaciation (orange). Almost the entire coastal plain is alluvium, but very different to the stream courses to the west. The local name for this sediment and landform is 'carse', the Stirling carse, an impermeable silty clay formed by the decay of estuarine salt marshes (Smith et al. (2010), unremittingly difficult to traverse when wet and rock-hard when dry. Peat formed on part of the carse (below) and is still preserved (pale brown) in the east.

Where the battle was fought is unclear. More than in many confrontations, where it was fought depended very much on how commanders perceived the ground. The objective of t the English army was to lift a sustained Scots siege of Stirling Castle (Pollard 2016), but the Scots army was in the way. How best to go round the Scots army was the special, geographical problem. Two routes are caricatured in the titles to this pair of papers, a 'low road' to the east or a 'high road' to the west. They each had significant environmental disadvantages which were probably known to the combatants, but which have not been understood or absorbed. In these contributions, we briefly present the often confusing descriptions of significant landforms and geographical features marshalled by military historians and present details and data from our analyses, document-driven and scientific, in order to understand more clearly the decisions made and the difficulties encountered by the two armies.

The battle summarised

The Battle of Bannockburn took place on the 23rd and 24th June 1314, between English forces led by Edward II and a defending Scottish army under Robert Bruce (Brown 2008; Cornell 2009; Penman 2016). Though named from a stream, the Bannock Burn, this alone is no guide to where the battle took place because it crosses the entire area (Figure 1a). Edward came to Stirling from the south east, from Plean, approaching Stirling along a broad St. Ninians ridge. Hereabouts his way was blocked by a Scots army. Minor skirmishes were fought on the first day which led to Edward abandoning the direct route to Stirling and trying to circumvent the Scots. He could have descended the St. Ninians ridge on its east side onto the low-lying estuarine plain; he might have moved west and north to higher ground. The battle itself was on the second day: it is not known where. Edward was heavily defeated, his army routed.

Changing views of the Stirling carse in 1314

Modern descriptions of the battle derive their landscape models from nearly contemporary narrative accounts: Barbour's *The Bruce*, probably written *c*. 1375 (Duncan 1997), Gray's

Scalachronica of *c*. 1355 (King 2005) and the Lanercost Chronicle (Maxwell 1913). None of these are strictly contemporary. All are biased, imprecise and strewn with hyperbole.

In the 19th century, if the carse was considered in relation to the battle, it was to dismiss it since 'the carses, in the Reign of King Robert Bruce, formed an almost impassable morass' (Sinclair 1796, 388). Yet most modern interpreters locate the battle on the Stirling Carse (Figures 1, 2; Pollard 2016). They cite two nearly primary sources. Barbour stated that 'thai [the English] herbyeryd thaim that nycht/ Doune in the Kers [carse]' (Duncan 1997, 467); Gray wrote that 'the king's [Edward] army ... had come to a plain near the River Forth, beyond the Bannockburn, a foul, deep, marshy stream, where the English army unpacked and remained all the night' (King 2005, 75).

Barbour described the carse as marsh ('marreiss'), 'an evil, deep, wet marsh' (Duncan 1997, 418-9), and that 'in the Kers pulis war' (ibid 467). The etymology of 'pulis' is critical but problematic. Mackenzie (1913, 66-7) understood 'pulis' to mean 'pools'. Barrow (1965, 303-5; 1985, 211-3) suggested that 'pulis' did not mean pools but pows, slow-flowing sluggish streams, locally pronounced 'poos', which made the carse 'boggy and intersected by countless streams of uncertain depth' (ibid 212): the English nevertheless bridged these (Duncan 1997, 469). Edward may indeed have been forewarned of these because before the battle he was told that the Scots may lie 'in certain strongholds and morasses, which are nearly inaccessible to cavalry' (Cornell 2009, 139): in fact the Scots took the high ground. Further topographic clues are nearly primary descriptions of the English rout, with Gray's *Scalacronica* describing how 'The men in the English rear fell back on the Bannockburn ditch, falling over one another' (King 2005, 75) and the Lanercost Chronicle likening the Bannock Burn as it crosses the carse (Figures 2, 3) to 'a great ditch ... into which the tide flows' (Brown 2008, 85).

The carse is today thought to have been an active agent in the battle, benefitting the nimble Scots infantry and bogging down English cavalry. To Watson and Anderson (2001,5-6, 29) the carse was 'a heathery, stream-riven environment', though 'the English knew of a dryish bit of ground', following Barbour, who recorded that the English found 'hard feld' (firm ground) after bridging the 'pulis' (Duncan 1997, 469). To Reese (2003, 122-4) the carse was 'flat wet meadows ... the pows running through 'deep peaty pools with crumbling, overhanging banks ... 'as treacherous as quicksand'. Nusbacher (2005, 171) described a 'tidal bog'. Sadler (2008, 95) saw the eastern carse 'bisected by a myriad of small brooks and water courses'. Cornell (2009, 183-4) imagined the carse was 'threaded with treacherous streams and marshes ... Underfoot ... composed of soft, peaty earth', 'a perilous morass of soft, swampy earth' and the Bannock Burn 'a formidable obstruction' cutting 'high-banked channels and gorges through the carseland'. But more recent document-driven analyses have emphasised the extent of 13th century anthropogenic peat clearance and consumption (Reid 2013; Ross 2016).

Methods

We sought to reconstruct the terrain by identifying geographical features and sediment stratigraphies that existed by the 14th century AD from existing sources and fieldwork. Sediments were recorded in sections and described from cores on linear transects sunk by hand-operated lightweight peat gouges. Sediment samples were retrieved for laboratory analyses by a 1.0m long, 6.0 cm diameter closed-chambered Russian corer which protects sediment from contamination. Radiocarbon (^{14}C) dating was key to reconstruction. The humic acid fraction of organic samples was dated by AMS techniques (Dunbar et al. 2016). Age estimates were calibrated using OxCal v4.3.2 r5 (Bronk Ramsey 2017) with the Intcal13 atmospheric curve (Reimer et al. 2013): all assays quoted are calibrated to give calendar years BC/AD. Sediments at Netherton were analysed for their diatom contents, multi-cellular micro-organisms that can define the salinity of the environment: samples of 1 cm thickness were prepared by standard techniques, counted to *c*. 300 valves and identified with standard keys. Pollen analyses at Balquhidderock Wood were from 0.5 cm thick samples, prepared by standard techniques and counted to a sum of *c*. 300 land pollen grains. Summaries of these only are presented in this paper.

The descent to the carse

The *c*. 150 m long and steep (30 % gradient) slope from the St. Ninians ridge at Bannockburn to the Stirling carse (Figure 2) is a degraded sea-cliff (Smith et al. 2010). Despite the steepness of the slope, deep peat developed in river valleys as large mires, as in the Peterswell Burn at Greenyards (NS 815 900) where 2.75 m accumulated from around 6000 BC. Greenyards is around 500 m south east of the Bannock Burn. Pollen analyses here show that trees were locally absent after *c*. AD 700 as agriculture became established: soil erosion accompanied this (Birnie in Rideout 1995). In the Peterswell Burn valley, we ^{14}C dated *c*. 150 cm of high-energy fluvial sand and gravel deposits derived by soil erosion to after AD 1400-1450 (Table 1: SUERC-44630).

Directly north west of the Bannock Burn is Balquhidderock (Figure 2), today a 6.2 ha, *c*. 600 m long, <150 m wide wood clinging to the steep slope above the carse. It has been seen as important at the beginning of the second day, either concealing Scottish forces (e.g. King 2005, 74) or where English forces regained the high ground (Barrow 1965; Watson and Anderson 2001). Despite the steepness, the slope is poorly drained and gullied. At NS 805 992 a typical small peat deposit, 6 m long, 3 m wide, with > 60 cm of herb peat, was ^{14}C dated by 38 assays (only the deepest (SUERC-44620) and youngest (SUERC-47338) age estimates are given in Table 1) which allowed modelling by Bayesian techniques, and analysed for pollen to understand its appearance in the early 14th century. Peat began to grow in the 1st millennium AD when alder trees were abundant with ash, willow, hazel and holly in an open-canopy wood. The slope was probably too steep and wet to cultivate. Woodland was still present, above a hiatus in peat growth, after *c*. AD 1350, with fewer alders and more ash and willow, probably not a dense wood, and from documentary evidence, wood pasture in AD 1471 (SCA PD189/70 Inventory; B66/1/1/1, p. 1).

The extent of the Stirling carse in the 14th century

The carse is not a single entity. Though everywhere composed of silt and clay, it is a complex, multi-period landform constructed periodically over the last *c*. 7000 years in response to long-term relative sea level fall (Smith et al. 2010). Of recent interpreters, only Nusbacher (2005, 162-188) distinguishes between 'high' and 'low' carse. In fact, there are four flat terrace surfaces, marked in Figure 2 as the Highest Level, the 2nd and 3rd Level and the Floodplain. These formed at different times and have experienced different environmental histories, the oldest being the highest, with lower and younger surfaces closer to the River Forth. The highest surface at 12.1-12.9 m OD (British Ordnance Datum, the mean sea level at Newlyn in Cornwall) was abandoned by falling relative sea level after *c*. 3650 BC. Existing ^{14}C assays (Smith et al. 2010) could not demonstrate that all four terrace surfaces existed in the 14th century. The 2nd and 3rd Level surfaces nearer the Forth, at 8.3-10.1 m OD and 5.5-7.0 m OD remain undated. The estuarine floodplain of the River Forth at 3.7-5.1 m OD was undated until our work.

We have shown that the floodplain was constructed well before the 14th century AD at two localities. In the bank of the River Forth at Netherton, west of Causewayhead in Figure 2 (NS 78542 96111) a freshwater peat overlying clay with both freshwater and brackish-marine diatom taxa is ^{14}C dated to 2470-2830 BC (Table 1: SUERC-45762). Near the mouth of the Bannock Burn, shelly estuarine sediment filled a large abandoned meander in the floodplain of the River Forth (Figures 2, 4: NS 824 935), its surface at *c*. 3.3 m OD. Organic sediment at 1.72 m OD is ^{14}C dated to 820-1010 BC (Table 1: SUERC-45307). Sediment above this could not be ^{14}C dated. More topographical detail is provided, however, by a description of the lands in 1587 of Bolfournought as *cum fluvio seu aqua de Forthe circumseptas* [surrounded by the river or water of Forth] (Miller, 1931, 18-19; NRS CS7/57 f. 406). What is probably described here is the River Forth flowing then in the large embayment east of the present Bolfornought Farm in a 40-50 m wide channel, now abandoned, making the carse ridge to the north a peninsula (e.g. surrounded by the Forth) and making the mouth of the Bannock Burn enter the Forth up to 500 m upstream of the confluence today, near Stewarthall (Figure 2), a substantial change in palaeogeography. If correctly interpreted, this channel was the River Forth at the time of the battle. The sediment surface at *c*. 3.3 m OD is a minimum for the depth of water in the channel. Excavation of cropmark features on the higher ground (3.47 m OD) of the core of the abandoned meander (NS 8259 9383) uncovered sherds of possible 15th to 16th century pottery in shallow ditches (GUARD Archaeology Ltd 2012). These finds would suggest the embayment was dry ground by the 15th century, probably with the abandonment of the meander as the Forth 'beheaded' it by a straighter channel: no change in relative sea level is implied in this. At very high tides today the surface of the abandoned meander can be covered.

The exaggerated meanders of the River Forth east of Stirling (Figure 2) will have meant the erosion over time of the carse but preservation of Medieval archaeological features at Cambuskenneth, and of the abandoned meander at Bolfournought, suggests that erosion has not significantly reduced the carse since the 14th century. We think that the entire width of the carse today could have been exploited by both armies in 1314.

Streams on the carse

Three streams cross the carse from the St. Ninians ridge (Figure 2), from west to east, the Pelstream and Bannock Burns and the Cocks Pow. The Pelstream Burn flows to the Bannock Burn and the Bannock Burn and the Cocks Pow flow into the Forth Estuary. The Bannock Burn is around 12 m OD where it debouches onto the carse from a *c*. 500 m long, *c*. 100 m broad and *c*. 20 m deep but comparatively gentle meltwater channel in Ladywell Park at Bannockburn (Figure 2). Where it hits the flat carse the contrast in gradient has created a small alluvial fan of well-drained sand and gravel. Much of this sediment will have accumulated during deglaciation but some accumulated after *c*. 3650 BC as it accumulated on the oldest carse surface: we could not date the sediment. The other streams lack the length, fluvial discharge and sediment load to make alluvial fans.

The streams on the carse must post-date the period of high relative sea level that formed the oldest and highest carse surface, forming after *c*. 3650 BC. Because carse surfaces are flat and have no erosional potential the carse quickly became geomorphologically inert. This is one reason peat quickly formed (below). There are no old, abandoned stream courses on the carse. There cannot have been more than these few streams crossing the carse in the 14th century, and these were where they are now. Figure 4 depicts a network of shallow gullies picked out on LiDAR on the highest carse surface falling, in particular, to the Cocks Pow. These delicate, shallow, dry channels are former tidal creeks preserved from the short time between relative sea level fall and peat spread (below). Their preservation is considered in the discussion.

The major active streams in their lower courses are deeply incised, up to three metres, below carse surfaces, forming gorges. Incision developed as relative sea level fell in later prehistory: it probably ceased before the historic period when long-term relative sea level fall seems to have ceased. Incision made streams quickly become confined, their courses fixed. Because the carse is a cohesive sediment, incision created vertical cliffs forming the sides of these gorges. Incision has several other effects. One is the development of knick points on the river, reaches where the channel steepened to keep pace with falling sea level. These developed first at the confluence with the Forth but over time they migrate upstream. Figure 3 shows two knick points, at 1500 and 4600 m distance, both with insignificant falls of less than a metre over tens of metres, but their effect on the channel ceases beyond 5000 m distance. Above Skeoch at around 7500 m distance the channel is and was shallow between low banks and easily fordable.

A second effect of incision is the increasing depth of the Bannock Burn below tall carse cliffs. Figure 3 shows the altitudes of the four carse surfaces bordering the Bannock Burn and the water surface of the burn. At around 5000 m distance, near Redhall Farm, there is a drop of around 8 m from the highest carse surface to the present water surface; at Stewarthall around 2000 m distance the fall from the 2nd level surface to the burn is at least 6 m. This gorge is most like the description in the Lanercost Chronicle of the 'great ditch' of Bannockburn (King 2005, 75; Brown 2008, 85) and might suggest that the flight of English forces after the rout happened towards the River Forth. This reconstruction is complicated by the likelihood that river terraces part-filled the gorge. One fragment of a *c*. 2 m thick fill of fluvial silt and sand above coarse gravel was located in the Bannock Burn gorge at its deepest, *c*. 4.9 m deep, at NS 8175 9125: it could not be ^{14}C dated and optically stimulated luminescence (OSL) profiling (e.g. Muñoz-Salinas et al. 2011) indicated that OSL dating would be unsuccessful. In the mid-reaches of Bannock Burn, from Crook to Stewarthall (Figure 2), a single lower, one metre thick terrace is probably too recent to have been there in the early 14th century AD.

A third significant effect of river incision is in containing water and fluvial sediment to well defined, narrow (7-10m in lower reaches) slots across the carse, affording no opportunity for streams to create broad, well drained and easily traversed floodplains: they offered no easy way across the carse.

Peat on the Stirling carse

Thick beds of peat are only known, after decades of investigation, on the surfaces of the highest and oldest terrace surface, furthest from the River Forth at 12.1-12.9 m OD (Smith et al. 2010). This surface covers some 35 % of the Stirling carse. Peat began to form on the flat, impermeable carse surface when relative sea level began to fall, after *c*. 3650 BC. It rapidly developed as raised mosses, low domes of peat several hundreds of metres across but with steep sides, fed only by precipitation. There is no flowing water on the surface, but ground water is just below the surface, making them very difficult to cross. West of Stirling individual mosses coalesced over time, though not to the extent assumed by early workers (Cadell 1913; Harrison and Tipping 2007). Here the peat, 5-7 m thick, was cleared for agriculture largely after the late 18th century (Harrison 2009). East of Stirling the extent of the peat is very unclear. We ^{14}C dated small patches of peat to establish this and to see whether any dated to the early 14th century. Peat at the bases of two small patches, now only *c*. 0.5 m thick, at Craig Moss (NS 83028 90646) and South Cockspow (NS 831 994) (Figure 2) are dated to 3542-3704 BC (SUERC-45110) and 2696-2905 BC (SUERC- 44623) respectively (Table 1). Their locations suggest they were once parts of Wester Moss, still extant to the east though very much reduced in area and peat thickness. It is likely that Wester Moss spread laterally to the Cocks Pow where flowing water and deposition of floodplain sands will have restricted further spread. Stream courses acted to constrain the lateral spread of raised mosses. No remnant of raised moss peat has been found west of the Cocks Pow, towards Stirling, but there is no doubt that raised mosses formed here too because sedimentological, pedological and hydrological determinants are precisely the same.

Large spreads of peat also developed in a different topographic setting, at the base of the St. Ninians ridge where streams and groundwater encouraged peat formation. At Westerton, on the oldest carse south of Wester Moss (Figure 2), the surviving spread is still around 1.5 ha. These were ^{14}C dated at NS 835 901 (Westerton III) by two ^{14}C assays (Table 1): extrapolation of these indicates peat formation at *c*. 7850 BC and for peat to have continued to grow in the 14th century AD. This peat will have merged with the raised peat of Wester Moss. Two large blocks of peat, some 50 cm thick, not *in situ*, were found in the channel of the Bannock Burn within *c*. 50 m of each other downstream of Skeoch (NS 81764 91357 and NS 81740 91444). One block at the latter locality is ^{14}C dated to 7580-7710 BC (Table 1: SUERC-47002). This is comparable in age to the *in situ* deposit at Westerton and probably formed in a similar setting and through similar processes. These blocks will not have been moved downstream far, though their sources could not be found in carse cliffs upstream. Peat was also encountered in boreholes at the base of Balquhidderock Wood (NS 809 911). A similar context is likely for a *c*. 0.4 ha., 70 cm thick heavily truncated fragment of *in situ* peat at Braehead (NS 798 926: Figure 1) at the base of the St. Ninians ridge near the centre of present-day Stirling. This accumulated from at least the BC-AD boundary (SUERC-46531) to at least *c*. AD 1000 (SUERC-47117: Table 1) before being truncated: this environment is still wet enough for peat to have been re-established in recent centuries (SUERC-47116 to -46528: Table 1). Pollen analyses describe a mix of arable and pasture in a nearly treeless landscape. Peat in the centre of Stirling, at the base of the hill to the castle at Station Square (NS 7968 9364) was found in excavation in 2015, its base ^{14}C dated to 3467-3398 BC, its top, probably truncated, from two assays to AD 1085-1124 and AD 1082-1151 (Will 2018). It is very likely from these four localities that thick peat grew all along the base of the broad ridge from which Edward may have descended in the evening and night before the battle.

Tidal influence

Table 2 is the current Admiralty tidal data for Alloa, downstream, and Stirling, upstream of the Stirling carse. The tidal range is large: spring tides to around 3.3 m OD (HWMOST: High Water Mark of Ordinary Spring Tides) reach, in the Bannock Burn, just above the confluence with the Pelstream Burn (Limit of HWMOST: Figures 2, 3). The altitude of the sediment surface in the Bolfornought meander is also *c*. 3.3 m OD but this is coincidental: this altitude is minimal for the depth of water in that channel. We could not find support from ^{14}C dating and diatom analyses for our interpretation of the documentary evidence at Bolfornought (above). A number of gullies on the lower Bannock Burn at Kill Knows (NS 818 914), Kersepatrick I (NS 817 919) and Dykes Ditch (NS 825 927), and in the Cocks Pow at Fallin (NS 836 922) (Figure 2) were incised below the present water surfaces but were then partly filled with 30-120 cm of clay and silt, suggestive of tidal deposition in the recent past, but they could not be ^{14}C dated, were contaminated, or proved to be modern. The chronology of relative sea level change in Smith et al. (2010) and after our work is not good enough in the historic period to infer tidal range in the 14th century. A minimum water surface for the River Forth at *c*. 3 m OD at this time need not have meant greater penetration of tidal water into the Bannock Burn because the long profile of the burn steepens above Redhall Farm (Figure 3). It would mean a greater depth of water downstream, however. It will also have meant the greater penetration and accumulation of estuarine mud, making it as Barbour described in Duncan's translation, 'difficult to pass because of [its] mud and depth so that none could ride over it' (Duncan 1997, 498). The Bannock Burn on the high ground, above the carse, could not, because of its flow, have been described as 'full of mud'.

That the surface of the River Forth might have been considerably higher than 3 m OD comes from excavation of the harbour wall, imprecisely dated from the 13th century AD, at the Watergate on the loop of the river west of Cambuskenneth (Figure 1; Baillie 2017). The wall stood on 'river clay', probably truncated carse sediment at around 3.6 m OD, and Baillie (ibid, 20) argued that the harbour could not have functioned unless the mean tide level of the River Forth, today 1.36 m OD (Table 2) was 'up to 2m or 3m higher than they are today'. This is very uncertain, implying spring tides to have regularly inundated the abbey grounds, and perhaps assumes too much, that the harbour functioned at all stages of the tide and for ships of deep draught.

The relating in the *Lanercost Chronicle* with a tidal Bannock Burn seems to imply that this was significant in the battle. and our reconstruction might suggest that the flight of the English was towards the confluence with the River Forth (men were reported as drowned in the Forth as well). That confluence, from our work at Bolfornought, may have been displaced some 500 m to the south of its present position.

New documentary evidence for land use on the Stirling carse before and after AD1314

Reid (2013) and Ross (2016) have emphasised the economic importance of the carse below and above Stirling from at least the 13th century. Cambuskenneth Abbey was founded on the carse around AD 1140. Edward I ordered a castle to be built at Polmaise near Fallin (Watson 1998, 199-200, 222; CDS ii, entry 1722). The place Kersie in St Ninians parish is recorded from AD 1150 and 'Badyndeth' (Bandeath near Throsk) from AD 1195. Polmaise paid grain teinds in AD 1215 (Cambuskenneth entry 118, 149-153), paid rents to the crown in AD 1359 (ER 575) and regularly appears in the Rolls thereafter, as do Ovenlands and Goosecroft, close to Stirling. Bolfornought is recorded from AD 1574 (NAS CS7/57 f. 406) but the name 'Fuleche' appears to correspond to Bolfornought, perhaps with the adjacent Taylorton (Figure 1), an agricultural asset from *c*. AD 1200 (Miller 1931, 18-19; Cambuskenneth 136-7, entry 104).

Settlements with arable land and meadows characterised parts of the carse west of Stirling from the 14th century (Harrison and Tipping, 2007) on the edges of and between raised mosses. Barrow (2005, 276 and note 49), however, argued for partial moss clearance in the early 14th century. In 1327 Robert I (Bruce) confirmed the customary rights which the burgesses of Stirling had enjoyed 'in the time of our predecessors, kings of Scotland' to peats from the moss which lay on the carse within the royal barony of Skeoch (RMS I App I, 41; Renwick 1884, 14-15). There is evidence, too, of peat clearance at Skeoch in the centuries after, in AD 1537 (ER XVII, 711), AD 1555 (Miller 1931, 14; Renwick 1884, 65; NRS RD1/2 f. 211r-213r; RD1/1, 242) and in AD 1617 (NRS CC21/5/2): disputes suggest that it was almost exhausted in the later part of the 17th century (SCA PD189/ 68/1, passim). Salt panning on the carse around Stirling is dated to before the mid-12th century (Oram 2012; Ross 2016), concentrated on the estuary. Wood was the initial fuel but after the mid-12th century, peat was the fuel and raised mosses became a valued asset. We can demonstrate from ^{14}C dating the working of raised mosses at Wester Moss, an extant bog near Fallin: a series of eleven ^{14}C assays from the highest part of the dome, intended to support detailed palaeoclimatic analyses, suggest an hiatus in peat growth between *c*. AD 500 and *c*. AD 1300 (Table 1). By the later 13th century, Oram (2012) notes, a more convenient energy source for salt panning, coal, meant a change in how salt was produced and the migration of pans further downstream. This might mean that the intensity of peat clearance lessened. General Roy's Military Survey (1747-1755), which can be shown by comparison with contemporary estate plans to be accurate on the Stirling carse (unpublished data), depicts Wester Moss sprawling west across the carse close to the Crooks Pow, south to the slope up to Westerton Farm and to the east, almost coalescing with the Dunmore Mosses. Only in the south east have the houses of 'moss lairds', a local term of mockery for impoverished Highlanders used to clear the peat on an industrial scale, encroached into the bog. Archival data also suggest that only two substantial areas of the carse were cleared of peat prior to *c*. AD 1700, at Skeoch Moss where by the later 17th century AD the peat was evidently being exhausted (RPS 1327/4/1; NAS RD1/2 f. 211r-213r; RD1/1 242; NRS RD1/2 f. 211r-213r; RD1/1 242; SCA PD189/ PD189/68/1 passim) and at

Bandeath Moss, documented several times in the later 17th century AD, always in the context of peat cutting and perhaps when final clearance was foreseeable (NAS SC67/50/4 1673-1676; SC67/49/6 61r; SC67/49/7, 261; SCA SB5/1/1, 9 Jan 1722 and 3 April 1729).

We failed to find sediments on the Stirling carse that might have characterised land use and the extent of raised mosses in the early 14th century from sedimentological or pollen data, though not for the want of looking or ^{14}C dating: we think such sediments have not been preserved.

Discussion: what was the Stirling Carse like in 1314?

If Edward II and his army descended from the St. Ninians ridge some time late on 23rd June 3014, as seems likely from the nearly primary sources, what might he have seen and thought? He would have seen the Stirling carse as wide as it is today, stretching over three kilometres between the bottom of the ridge at Balquhidderock to the River Forth, a long way away. The slope he descended was steep and not easy going, in some places poorly drained and boggy. Parts of the slope were farmland, as at Greenyards, but others were wooded still, albeit grazed as at Balquhuidderock, where soil and topography discouraged woodland clearance. It is sometimes thought that Edward led his forces down the Bannock Burn along the gently sloping meltwater channel connecting the village of Bannockburn to the carse at Balquhidderock (Figure 2) but its sides, steeper than at Balquhuidderock, were probably wooded, like Balquhidderock Wood, and its wide floor, probably marsh. But descending the slope east of this, between Greenyards and Cowie, would have placed the incised Cocks Pow and Bannock Burn between him and Stirling Castle. We agree with Pollard (2016) that once on the carse, Edward would have found the slope too steep, too cluttered with trees and too slippery to retrace his steps.

Edward would have encountered deep and wide peat at the base of the slope, probably everywhere, fed by run-off from the ridge, the peat we recorded at Westerton III, Skeoch, Balquhidderock and Braehead, and seen at Friary Square in Stirling. It extended across the carse for at least several tens of metres, as at Westerton today, where it is much truncated. One of the few ways across this peat might have been *via* the alluvial fan at the bottom of the meltwater channel, though it is of restricted extent.

Ahead was the Bannock Burn, for some 500 m a shallow gravel-rich stream between low banks. Beyond, the increasingly incised channel was probably lined and filled with alders and willows because there was nothing better to be made of it by farming communities. It would have made no sense for Edward not to cross the Bannock Burn as soon as he could, before the channel became incised unless his left flank was menaced from inside Balquhidderock Wood.

To the east of the Cocks Pow, on the ‘high’ carse, we have quite strong evidence for the persistence of an extensive cover of raised moss: the western extent of Wester Moss in later prehistory, from ^{14}C dating at Craig Moss and South Cockspow, is close to that mapped by General Roy in the mid-18th century. The cliffs of the Cocks Pow probably determined how far peat could spread. It also spread south to merge with the mire at Westerton and east to coalesce with Easter and Dunmore Mosses because there are no significant incised stream courses. West of the Cocks Pow we found no physical evidence for raised mosses, although it is very probable that from later prehistory they did exist, everywhere. The accounts of peat clearance from AD 1327 in the royal barony of Skeoch (above; Renwick 1887) make clear that workable peat did grow and survive to the west of the Cocks Pow.

The north-flowing incised streams of the Cocks Pow, Bannock and Pelstream Burns give a structure to the ‘high’ carse that is missing to the east, and missing west of Stirling where rivers flowing between mosses created well drained sand floodplains, allowing the carse to be traversed (Harrison and Tipping 2007). This structure would have made raised mosses more restricted in area, more contained. In turn this and their proximity to Stirling may have encouraged early clearance of peat for urban consumption (Barrow 2005; Reid 2013) or industry (Oram 2012, 2013; Ross 2016). By the early 14th century AD peat west of the Bannock Burn, it is argued, had been cleared from the carse: it was not a problem for Edward to have crossed. In support of this is the documentary record for land use on the carse around AD 1314 (Reid 2013; Ross 2016; above). For example, there were four acres of arable *sub nemore de Baquhadrok* (under the wood of Balquhidderock) in 1471 (SCA B66/1/1/1, 1). Other farmed sites between the Bannock Burn and Stirling included Ovenlands and Goosecroft (1359) and Muirton (1399) (ER I, 575; Miller 1931, 19; Ronald 1899, 112-14; Renwick 1887, 15). The sherds of Medieval pottery at Millhall Road (NS 804 920: Pollard 2016) suggest this also. Named settlements are, nevertheless, often on or close to the River Forth, on younger, 'low' carse surfaces which seem anyway not to have supported raised mosses (Smith et al. 2010). Of necessity, so is salt panning concentrated close to the estuary (Oram 2012). Peats for this industry are likely to have been sourced from the 'high' carse where it is closest to the river, as at Wester Moss which was being cut in the Medieval period (above). The shift in energy source from peat to coal towards the end of the Middle Ages was not because peat supplies were exhausted but because coal became more easily winnable (Oram 2013).

Skeoch on the 'high' carse where the Bannock Burn hits the carse is critical because of its location at the base of the St. Ninians ridge, the first part of the carse Edward may have encountered (Figure 2). Peat was being cut in 1327, in the mid-16th century and, still, in 1617 (above): this longevity might suggest there was much to be cleared in 1314. Tentatively, the survival of shallow tidal creeks on the carse between the Cocks Pow and Skeoch (above), that must date to the centuries prior to *c*. 3650 BC, might be taken to imply that their exposure to ploughing was very recent.

If we assume that Barbour correctly described the carse as a 'deep, wet marsh' (Duncan 1997, 418-9), wasn't hyperbolic and wasn't instead describing the Bannock Burn (which Gray described in similar terms: King 2005, 75), and that the raised mosses remained natural, then we can say that Edward did not have to traverse 'countless streams' because streams don't flow across raised mosses, but deep pools were certainly a problem. However, were the mosses ditched and drained before being cut, common practice (Harrison 2009), a more chaotic landscape of peat slumps and flows (cf. McEwen and Withers 1989) might have been encountered. Barbour's 'hard feld' beyond the peat pools (Duncan 1997, 469), needed for Edward to fully use his cavalry may, then, have existed only beyond the Pelstream Burn on the wide strips of lower, peat-free carse and the actively forming floodplain of the River Forth (Figure 2), north of the area around Redhall Farm that Pollard (2016) has defined from archaeological survey. It is here that provides the best ground for Edward's battle. It is likely that the major modification from our work to 14th century palaeogeography, the Bolfornought channel, is too distant to have influenced the battle, but may have played a role in the rout, pushing tidal water far up the Bannock Burn, making the water deeper, not enough to overtop carse surfaces but probably sufficient to mould and fill with mud the channels of the Bannock and Pelstream Burns.

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Figure and Table Captions

Figure 1. A map of the Bannockburn-Stirling area from the source of the Bannock Burn in the west to its confluence with the estuarine River Forth in the north east showing the topography and drainage pattern (Figure 1a), 'drift' geologies (Figure 1b) and the areas mapped in detail in Figure 2 of Part I and Figure 1 in Part II (base map (a): © 2016 OS Opendata); (b) BGS Geoindex Onshore (http://mapapps2.bgs.ac.uk/geoindex/home.html)

Figure 2. A geomorphological map of the Stirling carse and the Rver Forth, the area studied in detail in this paper (see Figure 1), showing in white, slopes above the carse, the meltwater channel in Ladywell Park at Bannockburn, the different surfaces in the carse (Highest, 2nd, 3rd, the floodplain and reclaimed land), representative transects of altitudes (OD), the breaks-of-slope between carse surfaces which represent degraded sea cliffs, streams crossing the carse, areas of extant peat on the Highest surface, limits of Mean High Water at Low Spring tides, locations of places mentioned in the text and sites ^{14}C dated in this study. The grid is 1.0 km on a side; north is to the top; the box outlines Figure 4.

Figure 3. A plot of the longitudinal profile of the surface of the Bannock Burn from the River Forth confluence to the base of Balquhidderock Wood from LiDAR imagery flown in 2012 at low tide, showing the relation of the water surface of the burn to the carse terrace surfaces bordering it, and to present day Mean High Water Spring (MHWS), Mean Tide and Mean Low Water Spring tides at Stirling (Table 2).

Figure 4. A LiDAR image of part of the area in Figure 2 showing the Bannock Burn and the outlines of former tidal creeks, settlements and the line of the A91 across the carse: yellow colours depict the Highest carse surface; green colours the 2nd Level surface.

Table 1. A list of AMS ^{14}C assays from sites discussed in the text by site in the order introduced in the text, defining the sample depth, material and organic fractions dated, the ^{14}C age BP (Before Present) at 1σ standard deviation, $\delta^{13}C$ and calibrated (calendrical) age-range AD/BC at 2σ.

Table 2. Present tidal data for the Forth estuary.