A GIS study of settlement patterns for the later prehistoric period with particular reference to southeast Wales.

By

Neil Martin Gunther

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Supervisors: Prof. Niall Sharples and Dr Stephen Mills

CARDIFF UNIVERSITY

PRIFYSGOL CAERDYDD

Contents

Summary

A need was identified by the Research Framework for the Archaeology of Wales to determine how the land was used and how settlements were integrated with various features in the landscape in later prehistory (Gale 2010, 2). Given the scale of the undertaking from a spatial perspective and the quantity of data available, this thesis lent itself heavily to utilising GIS. The use of GIS also opened up the region to its exploration with the application of various geographical techniques, which assisted in obtaining an understanding of the landscape firmly embedded at the level of the individual and that of the broader region.

Analytical and phenomenological scales related to measurement and experience, respectively, were necessary considerations of this thesis (Lock *et al.* 2014, 24). With least cost paths, for example, there was a move from something generated by an algorithm, which then facilitated placing the route within the context of an individual by allowing for the identification of potential place marks along the route. At the more local level, hillforts were buffered at 3.22 km, how long it might take someone to visit the neighbouring hillfort. The view that the north-south flowing rivers would have made communication difficult between the resulting blocks was tested by identifying potential fording sites (Cunliffe 2005, 293). As such, due consideration was given to how people would have moved through the landscape and engaged with it. At the more analytical scale, geographical parameters were analysed to discern what, if any, appeared to have been necessary for site selection.

The southeast Wales region incorporated parts of Brecknockshire and, in part again, parts of what would now be Herefordshire. These areas are fascinating as they afford an understanding of how the various regions may have been interconnected and how people moved through these liminal areas.

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List of Figures

List of Tables

Chapter 1: Introduction

Key research questions

As the Research Framework for the Archaeology of Wales observed in the *'Regional seminar paper, Southeast Wales, 22/12/2003- Later Bronze Age and Iron Age',* "Virtually nothing is known about later prehistoric landscape organisation" (2). A detailed regional study should therefore assist in addressing this shortfall and allow for the testing of several hypotheses. Two questions were posed, amongst others, in the '*Regional seminar paper, Southeast Wales – Later Bronze Age and Iron Age',* that are relevant to this study: "where are the bounded later prehistoric landscapes in south east Wales?" and conversely "where are the open landscapes in south east Wales?" (Gwilt *et al.* 2003, 5).

In 2010, some seven years after the 2003 seminar paper, the questions were subsequently expanded and refined to include:

1. How did hillforts function in the landscape?
2. What was the relationship between defended and non-defended sites?
3. What was the pattern of land-use and agriculture in this period?

(Review of the Research Framework for the Archaeology of Wales Responses to Research Framework Questions 2010). Question 2 should be revised to state 'enclosed and unenclosed sites' to reflect current thinking on such matters, as it utilises less loaded terminology. Furthermore, our understanding of the interrelationship between smaller hillforts and promontory forts, and how 'wetland' sites related to hillforts and other settlements is poorly understood (Davis 2017, 335 and 349). This assertion was made regarding Glamorgan, but it is equally applicable to Gwent and therefore southeast Wales as a whole.

> Understand how sites work in the landscape, permanent/seasonal, understand the social role of hillforts, understand the chronology of hillforts. We cannot understand social organisation without resolving questions of land use first.

Efforts have previously been made to address these concerns, at least partly, over the years in southeast Wales. Such examples include the study into the potential for 'line of sight' communication between hillforts in Gwent (Thomas 2000) and Makepeace's (2006) more comprehensive '*The Prehistoric Archaeology of Settlement in South-East Wales and the Borders'.* Despite these efforts, the Research Framework for Wales still considers how sites functioned as an issue worthy of further research. Since hillforts were a significant feature, from the latter part of the Bronze Age to the early sub-Roman period, their role in society should be determined (Britnell and Silvester 2018, and Lock and Ralston 2017). In terms of Wales, Guilbert (2018, 4), and Davis and Sharples (2020, 163) consider that the study of hillforts is relatively 'immature' to which this thesis will aim to address at least in part.

A further suggested research scenario by the Research Framework for the Archaeology of Wales was,

> Landscapes should be studied to identify features contemporary with known settlements and the organisation of their surrounding areas' (Review of the Research Framework for the Archaeology of Wales Responses to Research Framework Questions, 2010).

There is limited evidence for field systems in southeast Wales and, in any event, these would require study in their own right to accurately date them and identify their functional basis. However, partial boundaries and clearance evidence may indicate permanent occupation in upland Wales in later prehistory, as it has elsewhere in the British Isles, such as Dartmoor and the Pennines (RCAHMW 2003, 25).

The Framework (2022) subsequently observed, for the Late Bronze Age and Iron Age, regionality presenting itself within the settlement record of Wales and the Marches. Due to the fact that the settlement evidence, for the 1st millennium BC, has not been comprehensively researched makes it difficult to infer its ramifications though (*ibid.*). As such, this further supports the premise of undertaking a regional study in southeast Wales.

As Ghey *et al*. (2007) emphasised, chronological control was essential to the methodology of the Welsh roundhouse project to evaluate long-term changes in morphology and use. A longer-term perspective that transcends the somewhat limiting cultural periods usually proscribed, i.e. Bronze Age/Iron Age, might also assist in identifying social change by distinguishing broader changes that might otherwise be missed (Moore 2007a, 259). Furthermore, a more flexible approach to cultural and chronological boundaries is desirable, as it allows for an improved understanding of how external factors may have shaped cultures and for the independent, of one another, dating of archaeological remains (Davies 2014, 32). On a cautionary note, an extreme form of this should not be pursued, as a social context provided by such groupings is necessary to hang a narrative on and generate conclusions from (*ibid.*). From a regional perspective, it may be possible to discern differences in site occupation over period transitions, which might have resulted from adopting new materials, farming techniques or climatic change.

Such trans-temporal studies of a region allow, at least with a robust chronology, for the analysis of trans-regional and intra-regional change over time. This approach may be thwarted by the limited availability of a chronology and material culture for many areas of the British Isles in the Bronze Age when compared to the Later Iron Age. A number of such sites have been excavated, within the region, although insufficient "…to support either a credible chronological framework or a detailed understanding of Iron Age activity…" (Davis 2017, 328). Timmins' (2011, 17) thesis addressed some of these issues by comparing and contrasting enclosures of a known or probable Iron Age date but had a broader remit geographically. This thesis posed the following questions:

1. What was the role and significance of enclosures in Iron Age Wales?
2. Does enclosure form and location show regional difference or homogeneity?
3. If there is a difference, how can we tell a large farmstead from a small hillfort?

To answer these questions, Timmins identified four regions for study in Wales: the Brecon Beacons; Castlemartin Peninsula, South Pembrokeshire; and Anglesey. GIS software was then utilised to identify and compare resource availability, and measure the degree of intervisibility between sites.

The occurrence of material and sites from differing prehistoric periods may assist in identifying palimpsests within the landscape, potentially engendering an understanding of societal change over time. Considerable quantities of data is available that do not require further excavation to draw conclusions from. A significant problem in analysing this data is framing pertinent questions to interrogate the data with. Using such techniques does not preclude the need for targeted excavations of type sites to ascertain their chronological interrelationships though.

Aims

The principal aims of this thesis are to determine the factors, whether they be socio-economic, topographical, geological, pedological or proximity to a source of water on settlement location; landscape organisation; and the function of enclosures/hillforts within southeast Wales. To this end, the following questions were identified as being pertinent to the aims of this research:

1. What were the locational factors for settlements in the study area, such as proximity to water, underlying geology and topography?

2. How was the landscape structured/organised within the geographical context of southeast Wales during later prehistory?

3. What functions did hillforts perform in the region?

As Hill (1989, 18) observed, albeit the statement was made in 1989, there was and to some extent, this is probably still true, a tendency to rely upon "…confused and self-referencing interplay of 'taken for granteds', to produce a safe familiar past". More recently, however, there has been a shift away from such tendencies in that the evidence is being looked at afresh to draw new conclusions. One example is the revised interpretations of the so-called 'war cemetery' at Maiden Castle and ritualised midden sites (Russell 2019, and Madgwick and Mulville 2015, respectively). It will, therefore, be necessary to look at the evidence afresh and not be too uncritically bound to past theories and pre-conceptions of later prehistory.

Why a regional study?

As observed by Crumley (2006, 390), landscape studies is an area of study with its origins within many academic disciplines, such as geography, geomorphology, ecology and archaeology. A more holistic picture of prehistory can be drawn from these various disciplines and their associated traditions, and in the process provide a more complete picture of prehistory. Kantner (2005, 1180) observes that regional studies and settlement pattern analysis are synonymous, in many respects, to the extent that they "…are largely inseparable." The difference is a matter of emphasis; with settlement patterns, this is more sociocultural, whilst regional studies tend to be more concerned with people's interactions and their environment (*ibid.*). Cunliffe's (2000) work on Danebury and its hinterland can be seen as part of a general trend towards such a regional approach within Iron Age studies. In terms of the application of this approach, the Iron Age has seen a greater emphasis at this level than the preceding period, the Bronze Age (Davies 2014, 27). In order to get a more complete picture of the occupation of the region, in later prehistory, it will be necessary to combine these two elements and produce a synthesis of the evidence. After all, these people would not have existed in an environment divorced from its cultural references or vice versa.

More than a spatially limited site-specific study will be required to address the issues raised by the above questions. Renfrew and Bahn (2016, 42) observed that the answers to many questions, from an archaeological perspective, can only be gleaned by studying regions and their associated environmental parameters. An approach also endorsed by Haselgrove *et al.* (2001, 10) who acknowledge the necessity of moving from a focus on site-based studies when referring to the British Iron Age. Sites formerly tended to be just related, by archaeologists, to their immediate environs and hinterland. They should, however, have been considered within a broader regional context to ascertain how people lived within any given landscape, along with their associated socio-spatial structures. Additionally, one should not just blithely apply the findings from another part of the British Isles without first considering the data from the host region.

Doubt has arisen since the 1990s over the efficacy of applying models derived from Wessex to the British Isles and, as a result, regional narratives have evolved giving a more nuanced picture (Davis and Sharples 2020, 163; Davis 2017, 325; and Jones 2011, 1). The idea of a universal model has fallen out of favour and a more regional approach is coming to the fore that aims to reflect regional identity. Some of these regional approaches have, however, still been based on core areas, such as Wessex (Jones 2011, 1), albeit many of the examples cited by Jones relate to the Bronze Age. For example, Brück's (1999) article on Middle Bronze Age settlements in southern England. It has resulted in, as observed by Jones (2011, 2), a view of,

> …the chalk-lands of central southern England have become conceived of as a normative 'core area' and its archaeological record has been used to produce the synthetic narratives of the Neolithic, the Bronze Age and the Iron Age that are held to be typical of the rest of Britain…

Such a supposition gives further weight to undertaking a regional study encompassing southeast Wales that is not overly reliant on one of the perceived 'core areas', but set on generating a narrative that reflects the unique qualities of this region.

A regional study need not have a uniform geography, as in the Fens, but can include a range of geologies, soil types, topologies, morphologies and ecological niches. Regions, drawn from an archaeological perspective, tend to be defined by significant geographical features, such as rivers. Whilst, the geology of Wales is varied and includes aspects of all the main geological systems (Howell 2007, 1). This variety lends itself to a regional study, as it allows for comparisons to be made and contrasts sought from the available data. The boundaries of such a region can be defined by geographical features, cultural attributes or simply be arbitrary in its extent (Renfrew and Bahn 2016, 77). Conolly and Lake (2006, 208) came to a similar conclusion in that they recognised that some regions have a geographical presence, such as a watershed, readily acknowledged and whose geographical conditions have an associated impact on human occupation. Conversely, the researcher may only recognise the region for analytical purposes, as can be the case with geometrical regions (*ibid.*). As such, they can be defined by the questions from which the research is derived (Kantner 2005, 1179). Geometrical regions are produced by buffering against geographical features present in the region or tessellation generated from polygons. Whatever approach is taken it is crucial that the region is defined explicitly prior to undertaking the analyses (Bevan 2020, 61).

Potential shortcomings of a regional approach

Sharples (2010, 21) identifies three potential shortcomings regarding the Wessex region and these concerns could equally be applied elsewhere, which might result from the competing interests of a local or a regional approach:

- The area is considered representative of the region.
- Conversely, the area is atypical and differs from the region.
- By focusing on the regional aspect, local differences will be subsumed.

These differences can be further exacerbated by a more detailed local treatment instead of a more generalised regional approach. To address these issues, detailed narratives of the landscape 'types' within the region of Wessex were developed(*ibid.*). It was necessary to compare and contrast settlement patterns throughout the region whilst being mindful of the above points made by Sharples (2010).

Typically, such studies subdivide regions topographically into upland and lowland areas, but this approach can give the impression of the existence of immutable boundaries (Jones 2011, 3). It also disregards that communities occupying differing topographical areas would have inevitably interacted (*ibid.*). Furthermore, the people of lowland areas may also have practised transhumance for spring/summer grazing. Cooney (2000, 17) refers to the complementarity of evidence obtained from different zones within landscapes for the Bronze Age in Ireland and such an approach has merit in its application for southeast Wales.

In generating a comprehensive picture of settlement for the period, such a study area would need to include a range of relatively discrete environmental types. For example, upland, estuarine/coastal and lowland, all of which the southeast Wales region encompasses. The region's upland and lowland areas, above and below 250 metres in elevation, respectively, provide a helpful contrast in settlement (Lancaster 2012, 10). A further breakdown of the regional landscape was achieved by subdividing it into areas that included the Usk Valley, Levels, Gower and the Vale of Glamorgan. These were then analysed regarding the broader regional context. However, as previously noted above, the region can quite legitimately be an artificial construct.

Factors influencing a region's cultural identity

Interactions between independent societies of equal standing or polities, hence the term peer-polity interactions, can take on many forms, such as the movement of commodities and ethnicity (Renfrew and Bahn 2016, 387 – 8). These elements can all be utilised evidentially to a greater or lesser degree in assisting in identifying cultural regions, as opposed to the more simplistic approach of cultural diffusion from an area of dominance.

Until recently, settlement patterns were probably dominated by local and regional consumptive patterns due to the relative difficulty experienced in transporting goods and produce over any significant distance. However, this does not predicate against a certain degree of intra-regional trade for certain high-value items, for example, driving livestock to a market. High-value goods tend to be more widespread, though at a lower concentration, and for this reason are not particularly appropriate to utilise when defining the extent of a geographical region. Interest in such items, in all probability, extended significantly beyond that of the source region. The widespread distribution of particular objects, such as axes, has previously been used to identify regions in the broadest sense for the Late Bronze Age (Davies 2014, 28). This approach has been far more legitimately applied to an area or region's locally produced non-high status material culture.

Potential communication patterns could be analysed at various spatial levels with differing goals and associated activities, such as the regional exploitation of markets (Aston 2002, 44). In south Wales, transhumance would have resulted in the regional and local movements of people in the pursuit of exploiting resources like the pasturage available at higher altitudes and, conversely, that within the Levels at certain times of the year. Bell *et al.* (2013, 333 – 5) consider that the Severn may not have been so much of a boundary, but should be seen as acting more as a conduit for the movement of people and trade in prehistory. To this end, the Caldicot and Goldcliff boat fragments would indicate that such a premise was entirely feasible at the time (Hamilton, 2004, 106). In the coastal areas of southeast Wales, the more significant nodal sites (i.e. an interface point between a port and its hinterland) may also have facilitated inter-regional exchange (Wilkes 2004, 53) with the southwest of England or Ireland. The River Parrett may also have facilitated such inter-regional trade by providing access to the Severn, thus allowing for the exploitation of the metal ores of south Wales (Cunliffe 2002, 181). As previously mentioned, high-status goods would have a wider circulation but would, in all probability, follow the familiar inter-regional trade routes. As such, a region would, therefore, not have existed in cultural isolation from its neighbours, including those further afield, and it may be possible to identify those potential interregional routes by utilising GIS.

Pottery produced within a region can be employed to demarcate areas of cultural affinity. Various considerations must, however, be considered when relying on this evidence, such as the usage and location of deposition, when drawing any conclusions (Lancaster 2014, 7). Cunliffe (2002, chapter 5) utilised the ‘saucepan pot’, from the late Iron Age, with its vertical sides, beaded rims and distinctive decorative styles for just such a purpose. By choosing such a geographically widespread object (i.e. Sussex, Hampshire, Wiltshire, Surrey, Berkshire, Somerset, Gloucestershire, the Welsh borderlands and parts of south Wales), the thought was that local differences between decorative styles would become apparent (*ibid.*). For south Wales, the Lydney-Llanmelin regional style was identified, forming one of the six other regional traditions. The statistical basis for Cunliffe's assertion is untested and therefore leaves it subject to challenge. Furthermore, the percentage of regionally specific features is still being determined for any given assemblage (Sharples 2010, 323); leaving some doubt over its efficacy as an appropriate identifier of regions, at least without statistical refinement. Utilising these common ceramic forms derived from safe, familiar forms to generate broad synthetic narratives can lead to very speculative assumptions being made that are spuriously considered factual (Jones 2011, 1).

‘*Gathering Time*', a research project, used Bayesian statistical probability to determine the degree of variability of change in the Mesolithic and Neolithic for southern Britain (Whittle *et al.* 2011). As should be expected, it was demonstrated that it took several generations for the entirety of the Neolithic package to be adopted within a region rather than the wholesale rapid adoption previously espoused. There should be no reason to presuppose that the transition between the Bronze Age and the Iron Age would have been so clearly demarcated either; therefore demonstrating how unreliable material culture is for constructing a precise regional chronology, as there would be no watershed moment of adoption (Davies 2014, 26). An example of such a conflation of ‘technologies’ from southeast Wales is the Llyn Fawr hoard Rhigos, Rhondda Cynon Taff. This hoard contained: two bronze cauldrons and tools of an 'insular', i.e., local, Late Bronze Age type, such as bronze socketed axes and chisels (Northover 1995, 285); some iron objects of a Hallstatt C type (i.e. c. 800 – 650 BC) of a mainland European manufacturer; and two bronze cast socketed sickles found in conjunction with an iron equivalent of the contemporary bronze type (Raftery 1994, 27 – 8 and Northover 1995, 286). Raftery (1994, 28) observes that local craftsmen continued producing items in bronze, though they were proficient in utilising the new material, iron.

The ritual elements of such sites should not be ignored, and their presence within southeast Wales, such as that at (GGAT 09479g (Archwilio 2020)) Langstone, Newport, with two bowls and a wine strainer, should be acknowledged (Mytum 2018). Such finds “…should not be seen in isolation…” and that it is only a matter of time before structures, such as that of the timber causeway at Fiskerton, Lincolnshire, are found in Wales (*ibid.*). Sites that have specific functions, such as metalworking, are poorly comprehended in terms of their locational/landscape pattern and may have had a ritual significance as opposed to a purely functional economic one (*ibid.*). This then further complicates the narrative that may be drawn from such sites, as one cannot solely rely upon economic models for explaining their locations. A site’s HER reference number will be utilised throughout this thesis to avoid confusion and to allow for cross-referencing with Archwilio.

Study region justification for southeast Wales

In assessing the need for a regional study of hillforts, one should be mindful of what work has been done previously and the conclusions drawn by these studies. However, detailed regional studies have only formerly been conducted on a limited number of hillforts, such as Danebury (Cunliffe 2000). This shortcoming has, however, been addressed somewhat by the following:

1. South Cadbury Environs Project
2. Strathearn Environs and Royal Forteviot project
3. Driver- Cardigan Bay and North Ceredigion

4. Sharples- Maiden Castle
5. Jackson- Welsh Marches

Driver's research was directed at a relatively small region, north Ceredigion, with little consideration for its comparative positions (Driver 2018 and Murray 2016, 30). No such detailed study has been undertaken in southeast Wales. Additionally, since southeast Wales has a wide range of environmental niches, such as salt marsh, uplands and dune systems, it lends itself to such a study. Utilising an area of diverse topographical types and at a sufficient scale should allow social narratives to be drawn from the available data.

A model of a regional approach can be seen for Maiden Castle, where the interrelationship between the hillforts and contemporary settlements was analysed to determine changes in settlement for the region (Sharples, 1991). Clarifying the potential interrelationship between upland and lowland enclosed forms, with their associated dwelling groupings, is another potential avenue of research (Research Framework for the Archaeology of Wales 2014, 3). Perhaps significantly, as a regional choice, southeast Wales has a wealth of such contrasting environmental niches, which may assist in the testing of various hypotheses, much as Tipping *et al.* (2008) did, by selecting upland and lowland areas to determine whether any changes in the late Bronze Age, in northeast Scotland, were due to climatic deterioration.

Within Wales, an effort, thanks to grant aiding by Cadw, has been made to address this shortcoming with a study of 'defended' enclosures of prehistoric date. The principal aim of this project was to produce an updated survey of the range of defended enclosures within Wales "…in terms of morphologies, scales and landscape settings, in order to inform management and protection strategies" (Wiggins 2006a, 3). Though the project was to inform management and protection strategies, much information present here can be utilised within the context of this research project. Davis (2017, 329) observes that the evolution of these 'defended enclosures' and their occupational chronology only get cursory coverage though.

Hierarchical settlement models concerning the Iron Age have now been usurped by approaches stressing individual agency, concerning landscape and social change.

Nevertheless, nothing has substantively replaced the previous paradigm (Moore 2007b, 80). Such regional studies tend to avoid the broader perspective of settlements and social change (Gerritsen 2003, 110), which is strange given that such studies would lend themselves to this. It has also been argued that Iron Age societies may have exploited landscape references to allow groups to relate to the larger social group; this should be discernible at the regional level (Moore 2007b, 95).

Cunliffe (2002, 68) observed that though the data may be ‘grossly inadequate’ when referring to Iron Age Britain, useful generalised information can be drawn by relating the data to settlement, artefact typology and belief systems. The relative absence of large-scale excavation and datable cultural material will inevitably hinder such a regional study in southeast Wales nonetheless. This absence of evidence in Wales is put down to the "…inhospitable nature of much of the countryside…", which apparently "…ensured that considerable areas remained uninhabited…" (*ibid.* 206). Whilst this assertion may be true in the more extreme areas, it is a sweeping generalisation and is, furthermore, unsubstantiated by Cunliffe. Additionally, Cunliffe's (2002) 'Iron Age Communities in Britain: An account of England, Scotland and Wales from the seventh century BC until the Roman Conquest' somewhat neglects Wales regarding its settlement. Other than within a tribal context, it gets little mention, although the Severn estuary region merits consideration under the section entitled 'The Severn-Avon valleys and the west Midlands'.

In general terms, southeast Wales is deemed as construing part of the 'hillfort-dominated zone', whilst southwest Wales is typified by 'strongly defended homesteads' (*ibid.* 74). These settlement propensities are considered to reflect that of the Early and Middle Iron Age by Cunliffe (2002, 74 – 5). Southeast Wales is, therefore, an ideal region to compare and contrast these two ‘types of occupation’, as the west of the region falls into the former category and the east the latter. Notwithstanding terminological difficulties, small hillforts occur in Cornwall, northern England and southern Scotland, putting them right on the western and northern periphery of what was to become Roman Britain. Still, the most common form of habitation would probably have been the farmstead, enclosed or otherwise.

Questions have been raised about whether sufficient regional studies have been done in Wales and whether a micro-regional approach may be more appropriate (Research Framework for the Archaeology of Wales 2014, 2). To counter this assertion Howell's (2006, 48 – 9) work, cited by the Research Framework for the Archaeology of Wales as a regional study, highlights the need to determine the interplay of hillforts and smaller sites within the region. Such an approach would be best dealt with at the regional level instead of the local/micro level. Furthermore, Howell (2006, 9) also considers the region as being ‘under-investigated’, in archaeological terms, when compared with other areas of Britain, such as Wessex. This would therefore lead one to presuppose the necessity of further work in the region despite the assertions of the Research Framework for the Archaeology of Wales.

Despite the title *'Searching for the Silures: An Iron Age Tribe in south-east Wales'* and being considered a regional summary, Howell (2006, 20) confirms the currently available evidence “…cannot bring the Silures into sharp focus”, which duly indicates the dearth of the available evidence at the time of writing. Gwilt (2007, 297), regarding South Wales, supports this stance when it is observed that this “…is partly a symptom of the paucity of survey, excavation, and research…” undertaken in the region. These observations demonstrate the clear need for further research in southeast Wales. A correlation has, however, been noted between regional late Bronze Age metalworking styles and later Iron Age tribal boundaries and utilised to infer the late Bronze Age origins of such tribes (Davies and Lynch 2000, 179 and Gwilt 2004, 113). The Llantwit-Stogursey bronze metalworking tradition is broadly concurrent with the Silures’ tribal area. However, this should be treated cautiously as hoards of this tradition have also been found in Powys and southwestern England (Gwilt 2004, 113). These outliers should, perhaps, be considered indicative of the extent of the Silures' sphere of cultural influence rather than an actual expression of their territorial extent though. In any event, too much emphasis should not be placed on the region being a discrete entity from the rest of Wales and the wider British Isles.

To perhaps understand the nature of the relationships of settlements within any hierarchy (should it exist), it would be beneficial to limit the study to a potential tribal/geopolitical region. In this case, the Silures, albeit the tribe, may have only existed under a loose federal grouping of clans (Lancaster 2014, 38). However, they are considered to have had enough political coherence to merit consideration as a tribal entity (Howell 2013, 13). Lancaster (2014, 4) argues that the settlement pattern observed in the region indicates a "…decentralised political and social structure", although this hypothesis was not tested statistically to see if the available data corroborated the assertion. Additionally, tribal boundaries would probably have respected significant geographical features, such as rivers or mountainous areas, as observed in the Sussex Downs, Chilterns and Wiltshire with their associated river valleys (*ibid.* 5). These boundaries, regarding the Silures, have been described as Glamorgan and Gwent extending out to the river Wye in the east and the Gower in the west (Cunliffe 2002, 206, and Oatley and Howell 2013, 12). Glamorgan Gwent Archaeology (GGA), now part of Heneb as of April 2024 following the merger of the Welsh archaeological trusts, area is broadly concurrent with this area (see Figure 1).

It is worth noting, as indicated above that there is considerable debate over where the territorial boundaries lay if they were ever defined as such by the Silures, with the probable exception of the coast (Howell 2013, 7). Arguably, none of the above river boundaries appear particularly significant except for the Severn, although the Wye presents an imposing topographical feature in terms of the Wye Valley. However, the region's rivers in their lower reaches, where they are estuarine, present an imposing physical barrier, particularly when one considers the tidal ranges involved. Furthermore, the Severn Estuary has one of the highest tidal ranges in the world and this is reflected in the associated tributaries, particularly towards the eastern edge of the region. This tidal influence can and does extend for several miles inland. For much of prehistory, there would have been a reliance on ferries or fords in the upper reaches to enable crossing such rivers. Crossing the lower stretches of these rivers, even at low tide, would have been made treacherous by the presence of fluvial or estuarine mud and the rapid tidal changes.

Jackson observes (1999, 90 – 8) that hillforts in Gloucestershire and Herefordshire tend to be larger on average than those in Gwent. This finding was subsequently utilised by

Figure 1: The study region within the broader context of the British Isles

Lancaster (2014, 6 – 8), along with the various structural features of hillforts, such as entrance and guard chambers, to define the easternmost territorial extent of the Silures. For the western extent, Lancaster (2014, 8) utilised the increased density of Iron Age settlement on the western half of the Gower, which can be "…explained by a separation of neighbouring cultures and peoples". A more straightforward explanation may be that the Gower may have existed as a relatively discrete entity due to its geography and was not subdivided, as indicated by Lancaster. On its northern side, it is bounded by the Loughor estuary, to the south by Swansea Bay, southeast by the rivers Tawe or Neath and the northeast by Graig Fawr. The adoption of ringforts (defended farmsteads) in southwest Wales, as opposed to the continued use of the hillfort from c. 250 BC, is also cited as indicative of a different settlement pattern than that for southeast Wales (*ibid.*). These boundaries were not necessarily static, as Lancaster (2014, 5) acknowledges when it was asserted that an extension of the Silures' territory may have occurred in the late Iron Age, around the Brecon area into the former county of Brecknockshire. These assertions lend further weight to utilising GIS in determining the extent of the southeast Wales region in prehistory.

Howell (2006, 49) observes that several hillforts in southeast Wales appear to be paired at river valley entrances, such as the Gaer, Newport and Lodge Hill, Caerleon that are adjacent to the Usk. Such a hypothesis should be tested to assess its validity in terms of its frequency throughout the region and the likely explanation(s) for its occurrence, such as proximity to potential fords. Additionally, reference is also made to potential clusters of hillforts, such as those along the Wye and Usk valleys on the southern edge of the Black Mountains (*ibid.*). Given that such clusters may indicate how hillforts functioned in southeast Wales in terms of 'catchment areas', indicators of clan groups or areas that may have fallen outside the region necessitated their further examination. In terms of catchment areas, this could include proximity to areas suitable for differing farming practices, such as upland grazing and arable farming. Such an approach would then broaden the available resource base of such hillfort communities, making them less dependent upon a given type of farming.

Lancaster (2014, 4), when analysing the tribal area of the Silures, considered that larger hillforts constituted a greater significance,

> …whether as displays of wealth, status or for symbolic or communal purposes. The effort to construct such oversized enclosures hints at a social structure or authority capable of mobilising and coordinating necessary resources and labour (Children and Nash 2001, 138).

In Oatley and Howell's (2013, 13) opinion, hillforts and their function(s) are crucial to our understanding of the Silures. However, this should be addressed partly by filling the significant gaps in our knowledge of their lifestyle, social structures, hierarchies and belief systems (*ibid*.). A view endorsed by Ch'ng *et al.* (2011, 48), in that by utilising remote sensing, computing engines and agent-based models, it should enable novel means of data interpretation. The stated aim is to move "…archaeologists closer to their ultimate goal of approximating the individual within an extensive, interpreted, digital environment" (*ibid.*).

The project 'Atlas of Hillforts of Britain and Ireland', with the notable exception in west Wales of Murphys' (2010) project, on enclosed settlements and hillforts; there has been little input from south Wales. In terms of settlement evidence, Waddington's (2014) work in northwest Wales arguably has a broader remit and, to an extent, was built upon the preceding 'Welsh Roundhouse' project, whilst Driver's (2013) '*Architecture, Regional Identity and Power in the Iron Age Landscapes of Mid Wales. The Hillforts of North Ceredigion'* focuses on hillforts. A detailed study has not taken place in southeast Wales; therefore, undertaking such analyses should help redress this shortfall. Within Wales, an attempt, thanks to grant aiding by Cadw, has been made to address elements of this shortcoming with a study of 'defended' enclosures of prehistoric date. The principal aim of this project was to produce an updated survey of the range of defended enclosures within Wales "…in terms of morphologies, scales and landscape settings, in order to inform management and protection strategies…" (Wiggins 2006a, 3). Though the project was to inform management and protection strategies, much information that is present can be utilised within the context of this research project. By analysing regional data, it should be possible to ascertain variations in the form and construction of hillforts, as per Driver's work (2007). What could be called a regional or local architectural style may then indicate the extent of an area's overall socio-political identity. In north Cardiganshire, there appear to be similarities in the façade schemes, monumental display and the siting of entrances within the area (Brown 2009, 227).

Round buildings may have their origins in the third millennium BC (Ghey *et al*. 2008, 1) and Ghey *et al*. (2007) observe that there appears to be a growth in numbers post 1500 BC; when they then become a feature of the first millennium BC in Wales. This could be due to the increased dependency on a sedentary agricultural lifestyle, which occurred from the Middle Bronze Age onwards. Timber and stone were utilised to construct settlements during this period, although regional preferences exist, such as stone and clay in northwest Wales. From a position of a focus on enclosed settlement types at the start of this period, there was a move to more open settlement types by the Roman period. There is also a notable absence of roundhouses in northeast Wales by the Roman period, whilst the southeast and northwest show an increase for this period (*ibid.*). In northwest Wales, caution must be exercised when drawing such conclusions because they may reflect an emphasis on visible archaeology and a 'tradition' of survey. An apparent disparity has been exacerbated further between the southeast and northwest regarding the number of excavations of settlements. Even with these reservations, there is also a strip running through central Wales with a marked absence of the excavation of settlements. However, again, this need not reflect an actual absence of such sites. Due to the issues mentioned previously, caution should be exercised when coming to conclusions based on interregional comparisons other than in the broadest sense.

Why a GIS based approach?

Archaeology has a long tradition of both plotting and analysing spatial data to identify trends, and GIS can be seen as an extension of this tradition. GIS is widely used by many new postgraduate researchers and considered an invaluable tool (Green 2011, 53). Furthermore, GIS allows for the production "…of graphical representation, exploratory data analysis, and spatial statistics" (Maschner 1996, 6). This ability to create visualisations based on the available spatial data is particularly illuminating, as it allows one to 'explore' this data by producing thematic maps (*ibid*.).

Unfortunately, GIS is absent from a significant proportion of regional studies, much to their detriment, such as Lancaster's (2012) unpublished MPhil thesis. A further shortcoming of regional work here is that their study areas effectively exclude the wetlands adjacent to the Severn. As such, this then precludes a comprehensive comparative analysis of the available geographical parameters and their subsequent impact on settlement or land use. In the case of Makepeace, a relatively limited area of the southeast of Monmouthshire is included. Due to its limited spatial extent, it cannot be considered representative of the region. Murray's (2016) *'A GIS-based analysis of hillfort location and morphology'* also includes a chapter on the Gower. However, the Gower may not be considered representative of the southeast Wales region for reasons that become apparent later in this thesis.

As observed by Brown (2009, 183), the impact of the environment as a determinant in influencing people's actions in prehistory has been much debated despite the absence of analysis, in many cases, of locational data. GIS analyses of a region could synthesise available data sources and then paint a more complete picture. Much evidence can be obtained by analysing landscapes within the broader regional context, data for which can be obtained from the appropriate records; for example, the Historic Environment Record (HER), a sampling approach adopted or the use of all data within a specified area. GIS packages can quickly process large quantities of data with various computational approaches (Kvamme 1997, 50). To undertake this approach manually would be a gargantuan task, subject to the potential for numerous mistakes resulting from human error. These mistakes would mainly occur during the data entry stage, i.e. when sites were first entered into the HER, formerly Sites and Monuments Record (SMR).

In analysing a region, there is also potential for predictive results relating to previously unrecorded sites. Whilst this is not the premise of this thesis, such modelling can be useful in directing resource management and research for given locales (Yaworsky *et al.* 2020, 16 and Kamermans *et al.* 2009, 10). Machine learning has been demonstrated to have better predictive abilities when compared with non-machine learning regression models, although this does not necessarily mean it is best suited to a given dataset (Yaworsky *et al.* 2020, 17). When determining the appropriateness of a given model one must appreciate the limitations of archaeological data produced from a resource management inventory, i.e. HER (*ibid.*). Furthermore, the use of artificial intelligence may facilitate the scrutiny of aerial photographs in order to identify archaeological sites.

The application of least cost paths may be an alternative approach to determining the location of potential sites within the southeast Wales region. Such routes would probably have existed linking sites of significance, hillforts for example, for people within the region during later prehistory. These routes would have also linked settlements falling between such sites. Furthermore, it should be no surprise that the inhabitants would site monuments adjacent to these routeways in a landscape seated in cultural meaning. Since southeast Wales would not have existed in isolation, such routes would also have linked into adjacent territories and beyond to facilitate trade.

It is worth noting that a GIS approach is not without criticism. Whilst GIS may be considered to indicate objectivity, the data utilised may have arisen from subjective practices, such as targetting a given area for fieldwalking to the exclusion of other areas. Lock and Pouncett (2010, 193) observe that the adoption of GIS in archaeology, combined with changes in archaeological theory, ‘fetishised’ experience and perception of past landscapes. A phenomenological approach emphasising experiential aspects, such as landscape features, of a given construct is not without its merits though. However, a more balanced approach drawing from the differing archaeological traditions may be more advantageous. Seaman *et al.* (2020, 547) has adopted such an approach, utilising data processing, with the analytical functions of GIS, combined with the more established landscape archaeological approaches. This approach may also have synergistic consequences when drawing data from various sources. A horological approach supplemented by the more descriptive tradition, when based on findings that have been statistically tested, should then produce a sound narrative synthesis. Relatively simple statistical analysis, such as chi-square and k-means, can give any hypothesis greater credibility by testing its statistical validity. Cluster analysis also allows one to draw out patterns in the data from thematic maps of the region that one might otherwise miss, for example, locational preferences based on soil, aspect, altitude and proximity to water.

Region’s geographical extent and concerns over boundaries

The region's boundaries are defined by the rivers: Wye (Gwy) and Monnow (Mynwy) forming the eastern boundary; the Severn Estuary (Hafren), the southern; Loughor (Llwchwr) to the west; and Amman (Aman) to the northwest. It is further demarcated by the presence of the Brecon Beacons and Black Mountains to the north (Lancaster 2012, 10). The Brecon Beacons National Park extends into the study area, including the northwestern part of Monmouthshire and the northern extent of Neath Port Talbot, Rhondda Cynon Taff and Blaenau Gwent. Caerphilly and Torfaen also have a limited presence in the National Park. The study area comprises an area of approximately 3768.3 km^2 (c. 1454.95 square miles) and includes twelve separate unitary authorities.

In socio-political terms, geographically significant features, such as estuaries, tend to demarcate the extent of areas of local governance, a position entirely probable for prehistory. By endeavouring to limit the region to that of the purported, former tribal area of the Silures but relying on modern political boundaries leaves one open to criticism though. Harkel *et al.* (2012, 184) expressed reservations about such an approach. They advised against too much of an emphasis on continuity, as other boundaries were more ephemeral in the Dartmoor landscape. This, in all probability, could be equally true for southeast Wales. As such, caution must be exercised when relying on data from the geographical margins of the data set particularly when presenting an argument for geopolitical cohesiveness within an area. However, relying on significant geographical features, such as the Severn, to identify the region and looking at a relatively large area should minimise the risk of missing more ephemeral boundaries and skewing the data. There are a number of large urban centres in the region, with their associated infrastructure, whose development has resulted in a number of sites being excavated. This development led excavation has the potential to skew data and therefore such sites should not be seen as being representative of the region, spatially speaking (Ghey *et al.* 2007)

The former county boundaries of Glamorgan and Monmouthshire, adopted on subsequent local government re-organisation in 1996 with the creation of unitary authorities, had done likewise by continuing to use existing boundaries. Before this, the region consisted of the counties of Glamorganshire and Monmouthshire (see Figure 2) that owed their origins, at least in part, to mediaeval kingdoms. It should be noted that

Figure 2: Excerpt from a 1790 map of England and Wales.

Image copyright © 2000 by Cartography Associates.

the former county of Brecknockshire, now broadly speaking constituting Powys, lost territory to the unitary authorities of Blaenau Gwent, Caerphilly, Merthyr Tydfil, Monmouthshire and Rhondda Cynon Taff, in southeast Wales. Scrutiny of this location may also indicate whether this area is best placed in the southeast Wales region or within a separate region to the north.

Alternatively, Bell (2013, 4) and Lancaster (2014, 6) take a different stance here and question the merits of utilising modern administrative units, as these were unlikely to serve any meaningful purpose in prehistory. To counter this, at least in part, Harkel *et al.* (2012, 184) observe that,

> …the boundaries of many of the geographical and administrative divisions known as “hundreds” in south Devon, followed rivers and streams—many retaining their original British names—over large distances. Rivers, streams and linear earthworks are natural boundaries and routeways, making them an obvious choice to delineate territory.

This approach, as utilised in Devon, can legitimately be applied to southeast Wales. As previously observed, a region may only be recognised by the researcher for analytical purposes though (Conolly and Lake 2006, 208). Combined with the contrasting environmental, geological and topographical areas, it is ideal for a regional study.

Conclusion

A regional study of southeast Wales for later prehistory could provide valuable data regarding its contrasts and similarities. For example, the east forms part of the 'hillfort-dominated zone' whilst the southwest is typified by 'strongly defended homesteads' (Cunliffe 2002, 74). Nonetheless, many such sites probably fall somewhere onto a continuum rather than clean discrete categories regarding their size, morphology and potential function. A GIS study at the regional level may also assist in our understanding of the interrelationship between hillforts and other types of sites. Additionally, the various environmental zones within the region, supplied with a detailed narrative, should prevent such a study from becoming just a series of local studies.

By synthesising the available data with GIS, a more complete understanding of later prehistoric society's environmental and spatial patterns should be achieved. Furthermore, in determining the socio-spatial nature of a region’s prehistoric people, it is entirely appropriate to delimit it by the potential extent of their tribal area, a geographical entity (the region) or both. The various studies on the region’s periphery, such as Bell's (2013) work on the Severn Estuary, may assist in giving the region a broader framework within which to base its results and in placing it within the broader context of the British Isles.

Ultimately, this thesis addresses the issues highlighted by the Research Framework for the Archaeology of Wales, such as the function of hillforts in the landscape, the relationship between enclosed and open sites, and the pattern of land use. As Gale (2010, 2) succinctly put it, “We cannot understand social organisation without resolving questions of land use first”.

Chapter 2: The Study Area

Introduction

This chapter aims to set out the environmental parameters of the region in terms of its topology, bedrock, glaciation, superficial geology and soils. Additionally, current land uses will be discussed as they will inevitably impact the availability of archaeological material for this study in the form of agricultural practices and urbanisation. The major population centres are located along the southern coastal margins of the study area. However, the former coalfield communities in the valleys also have significant population centres, for example, Merthyr Tydfil and Ebbw Vale. Additionally, several small market towns in the broader eastern valleys, such as Monmouth and Usk, fall within the region.

It is worth noting that the division of landscapes into zones is starting to come under closer scrutiny, primarily due to the formerly rather "…generalised assumptions…" about areas being defined as falling within specific parameters, such as lowland and upland areas (Jackson 1999, 6). However, having a range of environmental zones to draw upon will give a more rounded picture of later prehistoric occupation within the southeast Wales region. Broadly, speaking the region can be split into three topographical zones: a coastal zone, including the Levels, dune systems and the immediate coastal hinterland; upland zone; and the area in-between, a lowland zone. Furthermore, as this thesis is evidence-based, drawing upon geospatial data obtained from various databases, it should avoid the danger of making such 'generalised assumptions' and allow for comparisons to be made between differing geographical and environmental areas. All altitudes were derived from Ordnance Datum unless specified otherwise in the following paragraphs, and heights expressed as above Ordnance Datum (AOD).

The bedrock geology is relevant to this thesis in three ways: it determines the topography; influences land use; and provides the raw materials utilised by prehistoric people (Bell *et al.* 2013, 7 – 8). Weathered geological material constitutes the regolith at the base of a soil's profile, otherwise known as the C horizon. The regolith need not be derived from the bedrock immediately below the soil, but may have been deposited by glacial or alluvial activity at a significant distance from its source. When comparing soil maps of Britain with geology, the resultant soils reflect that of the superficial deposits beneath them rather than that of bedrock geology (O'Hare 1988, 54).

Current and former land uses

The coalfield and northwest Monmouthshire are characterised by heath and moorland pasture at higher elevations, whilst at lower elevations, the extent of improved pasture increases (Pearson and Lewis 2003, 3 and Evans 2002, 3). These upland areas are generally unenclosed, as opposed to the valley floors that are more typically enclosed as fields. Extensive tracts of unenclosed common land are present immediately to the north of the Coalfield area. This upland area also formerly included extensive stands of coniferous forestry that are now somewhat depleted due to the wholesale clearance of trees to stop the spread of 'sudden larch death'.

The profound impact on the landscape of the Industrial Revolution should not be dismissed due to the extractive mining industries and metal processing. The spoil from the mines, deposited as extensive tips, and the waste from the foundries have significantly impacted parts of the coalfield, such as the area around Blaenavon. This material has buried swathes of the former, predominantly agricultural, landscape. The demand for a resident labour force in these, at the time, relatively sparsely populated areas resulted in the construction of what were effectively new towns, like Merthyr Tydfil and Ebbw Vale. Given the topography, the towns that were built resulted in ribbon development along the valley floors, which also included the provision of necessary infrastructure, such as the road network (Natural Resources Wales (NRW) 2014e, 2).

Development is concentrated in the coastal urban areas of Chepstow, Newport, Cardiff, Barry, Port Talbot and Swansea, with their associated industrial development that has taken place over the last 70 years. Many of these urban centres saw significant growth in the 19th Century during the Industrial Revolution, which then continued into the 21st Century. As a result, there has been a commensurate increase in the size of these urban areas, resulting in urban sprawl. To prevent the creation of conurbations, in the form of a merging Cardiff and Newport, Wales' only Green Belt, was created. The strong maritime influence on the region is exemplified by the presence of ports at Barry, Cardiff, Newport, Port Talbot, and Swansea, which cover a combined area of some c. 1538 hectares (c. 3800 acres (Associated British Ports, 2019)).

Most of the Vale has been set to pasture, but within the area are also tracts of arable land (Pearson and Lewis 2003, 4). In lowland Monmouthshire, arable farming predominates, although some dairying is present in places (*ibid.*). Along the region's coast, tourism has had a significant impact, predominantly to the west of Cardiff, and is best typified by the presence of caravan and camping sites, such as Trecco Bay Holiday Park. Whereas, at Port Talbot, the steel works form an extensive feature on this stretch of the coastline. However, by way of contrast, much of Gower and its lowland areas remain as agricultural land.

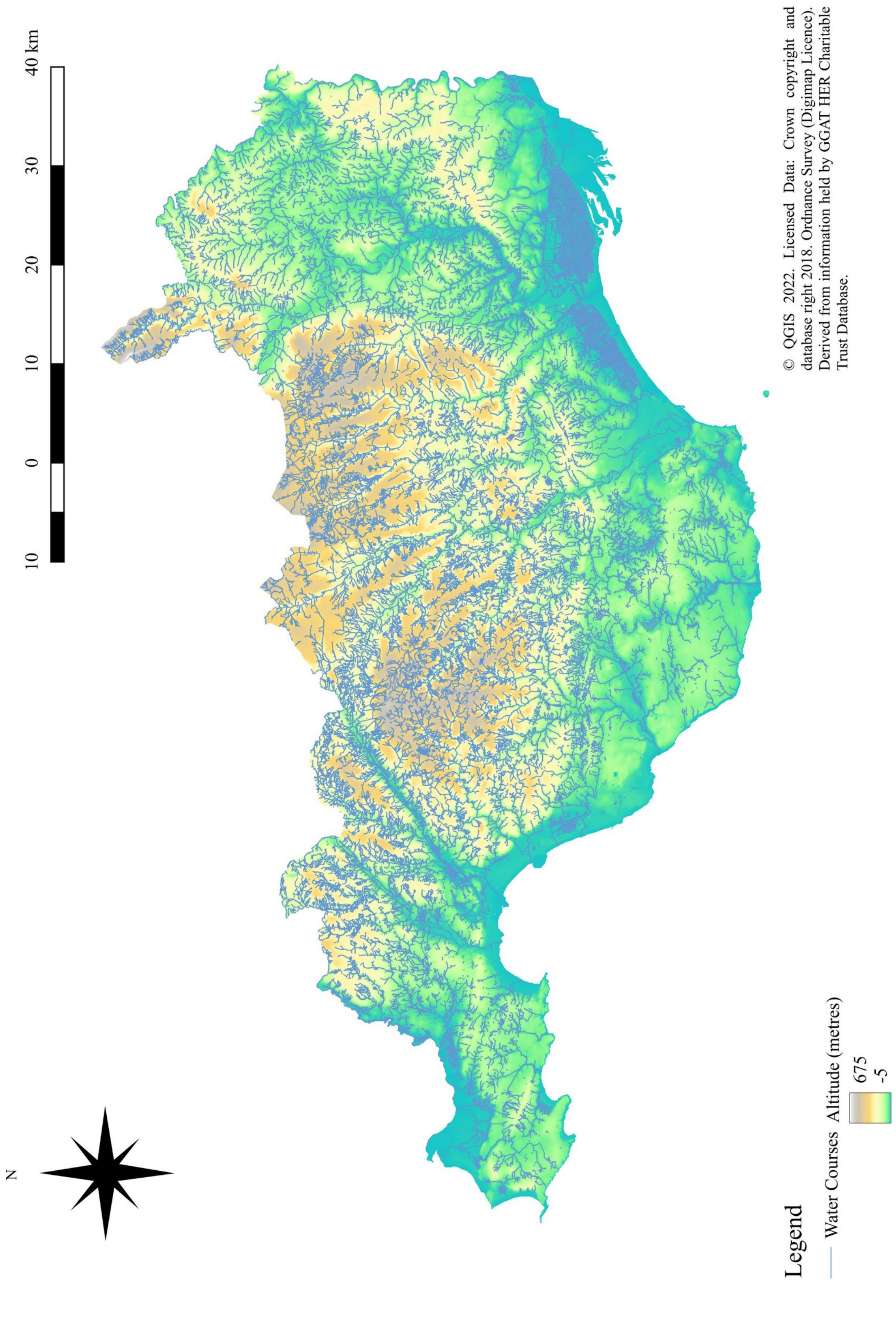
The upland areas of the region would, when initially cleared in prehistory, have been covered in brown earths. Once exposed, with the removal of their tree cover, to the weather they would then have deteriorated. These uplands areas may well have been subject to transhumance regimes, allowing for their exploitation for summer grazing, and in less extreme locations some form of mixed farming. To this day, the upland areas of the region provide rough grazing for sheep. However, Murphy (2020, 88) observes, in relation to the route of the South Wales gas pipeline, much of the route formerly comprised mixed farming/pastoralism, except for upland areas. Furthermore, prior to the draining of the Levels, these areas would have provided much needed spring grazing.

Geology and topography (see Figure 3)

At the root of any given natural landscape is the underlying geology, which influences both the types of soil ultimately generated and a region's relief (Allen 2017, 44 and Howells 2007, 1). This is particularly so when one considers that one of the main constituents of soil is the weathered bedrock, which results in the regolith. Such a topographical feature from southeast Wales would be the escarpment along the eastern edge of the coalfield running northwards from the Newport area, which clearly manifests itself in the topography here (George 1975, 1). The geology of a region can even have an impact on climate at the global level, such as the monsoon resulting from the effect of lower pressure caused by the Tibetan plateau, whilst at the local level, a rain shadow effect can be caused on the leeward side of mountainous areas. In eastern Wales, a rain shadow effect has also been postulated as mitigating against the direct effects of climatic deterioration in the Late Bronze Age (Davies 1995, 672). However, this is not to say that there were no effects in southeast Wales, as populations from severely affected areas could be displaced due to a decline in agricultural productivity.

The geology of southeast Wales can be divided into topographical areas with their attendant geologies. As such, the area was divided into three discrete zones: the upland environment that includes the coalfield and the Black Mountains; the undulating agriculturally rich lowlands; and the coastal margins (see Figure 3). Locock (2006, 41) describes two topographical areas: the Glamorgan Uplands and a lowland belt. However, Locock's topographical breakdown does not give justice to the extent of the Levels or dune systems present within the region. As can be seen, the area's topography is highly varied, which, though making any research complicated, has allowed common themes to be drawn out from the data for their respective areas. This variety can also be viewed as an asset for a regional study by allowing for comparative analysis within the region. For example, within 10 km of the former coastal wetlands of Gwent, the topology ascends to an upland area with the intervening area typified by hills (Bell *et al.* 2013, 7).

Figure 3: Watercourses and associated topography for southeast Wales.



South Wales Coalfield

The topography of the coalfield area (see Figure 4) is that of a plateau area (Howells 2007, 144), which is then characterised by a chain of marked ridges and narrow, deeply incised valleys (Locock 2006, 41; Evans 2004, 3; and Pearson and Lewis 2003, 3). The principle orientation of which is approximately north-south (Locock 2006, 41 and Evans 2004, 3). Nearer to the southern interface with the coastal belt, the height of the ridges declines and the valleys become somewhat broader (Pearson and Lewis 2003, 3), for example, around the lower extents of the rivers Rhymney and Ebbw.

The southern strip of the Brecon Beacons, included within the region, is characterised by high plateau and ridges broadly aligned to the cardinal points (Evans 2004, 3).

The Levels

The Gwent Levels form an area of artificially drained land, which has been encroached upon by the urban centres of Cardiff and Newport; the route of the A48 largely demarcates their northern extent. Before extensive land drainage commenced, this coastal plain comprised intertidal mudflats and estuarine alluvial deposits, with peat beds beneath Kueper Marl, i.e. layers of mudstone and siltstone. In geological terms, the area is dominated by superficial deposits, as opposed to the bedrock geology immediately to the north of the area. Most of the coastal area east of Cardiff and the river Rhymney in southeast Wales consists of the Levels. These are aptly described by Wiggins (2006, 3) as "…the low uniformity of the Gwent Levels". They rarely exceed 10 metres above sea level, generally at around 0 m OD, and form the northern coastal plain of the Severn Estuary (Locock 2006, 41).

Drainage here is heavily anthropogenically influenced, mainly by the imposition of dykes/ditches and canalised rivers on the landscape, constituting a distinctly cultural landscape. A key characteristic of the area is the drainage ditches called reens that bound the fields and the grips (shallow gullies), which drain from the fields into the reens. Between the rivers Wye and Usk, the landscape is best described as lowland (Lancaster 2012, 10). To prevent inundation by the Severn, at the margin of the intertidal zone, is a modern seawall. The drainage of the Levels, sea level rise (eustatic change) and the imposition of the seawall have all had a role to play in reducing the natural extent of the Levels. Large areas of the Caldicot Levels had, by c. 5000 BP, changed from fen woodland to raised bog in these coastal wetland areas (Nayling *et al.* 1997, 272).

Monmouthshire

In the northwest of Monmouthshire, around the Vale of Ewyas, lies the easternmost extent of the Black Mountains. Here, the landscape consists of mountains and steep slopes which descend into broad glacial valleys. It is worth noting the presence to the north and northeast of the Levels of Wentwood and a plateau around Trellech, Beacon Hill, at an altitude of 309 m and 306 m, respectively (NRW 2014a, 7). Some consider this area (Stanford 1980, 23 and Jackson 1999, 6) somewhat isolated, with the northern perimeter constituting the Monnow separating the area from the south-central marches. The boundaries for this suggested area have been somewhat unconvincingly argued to constitute "…on the east by the broken upland of Wentwood" (Jackson 1999, 6), which runs east-west.

Escarpments inclined to the southeast are a characteristic feature of this area, with slope angles falling within a range of 5 – 20º (NRW 2014a, 2 and 8). To the south, Monmouthshire's central and eastern parts are generally quite open and undulating. However, steep hill slopes and valleys characterise some areas, even here, such as the Wye Valley. The Lower Wye Valley reads as a relatively discrete topological entity when compared to the rest of Monmouthshire. Steep slopes and sheer rock faces, cut by the Wye, form a deep gorge that provides a distinct and imposing eastern boundary to both the southeast Wales region and Gwent.

Vale of Glamorgan

The Vale extends from the western margins of Cardiff almost to Bridgend and, geologically speaking, constitutes an area of limestone plateau (*ibid.* 2014d, 2). The

Vale has areas of high ground above 140 m in the northeast, for example, around Wenvoe. However, it mainly comprises a gently undulating landscape, which becomes flatter towards the coast (Pearson and Lewis 2003, 3, and NRW 2014d, 5). The gently undulating nature, at least in part, results from glacial till deposition in the area.

Unlike the Levels to the east, the Vale's southern boundary is demarcated by the presence of cliffs, whereas, before the creation of the sea defences the Levels would have primarily been salt marsh.

Neath Port Talbot and Swansea (Coastal Margins)

The coast here principally comprises a gently undulating lowland interrupted by narrow valleys. From Merthyr Mawr westwards, extensive dune systems dominate the topography of the coastal margin. Margam Mountain provides a contrasting juxtaposition with the adjacent landscape of the lowland coastal margin around Port Talbot. From just above sea level, the mountain rises steeply to approximately 200 m becoming less steep at this l. There are several peaks on the plateau, with Margam being the highest at 348 m.

Gower

ESE to WNW direction across the peninsula is Cefn Bryn Common. Rhossili Down and Llanmadoc Hill form the highest parts of Gower, which at their highest are approximately 180 m in altitude (NRW 2014g, 7). However, areas of higher ground, such as Rhossili Down Beacon at approximately 190 m, are present (Evans 2002, 3). Part of this area now constitutes unenclosed common land, but several prehistoric features are present, including funerary and ritual elements and evidence of potential occupation. Along the southern and western coasts are extensive beaches with associated limestone cliffs; salt marshes and dune systems dominate the northern area.

Coastal Erosion

Moving to the coast, in the Vale, the coastline is mainly rocky between Penarth and the Ogmore River. Pearson and Lewis (2003, 3) observe that erosion plays a role in destroying sites in this area. In support of this stance, they cite the disappearance of barrows, particularly those close to Barry. This loss will inevitably vary throughout the region depending on the substrate's resilience; for the Vale, this would be comparatively hard when compared with the Levels. As such, it is considered that the loss of coastline in the region of a few tens of metres in the last four millennia is not an unreasonable proposal (*ibid*.). Given that the environment here can be extreme, as evidenced by the formation of extensive dune systems to the west, this assessment is feasible. The tides may have scoured away structures constructed on or adjacent to the extant coastline, which inevitably leads one to question whether some promontory forts occupied liminal locations originally.

The power of the tides in the Severn estuary should not be underestimated, as it has the third-highest tidal range in the world at 14.8m, at Avonmouth (Bell *et al*. 2013, 1). Coastal erosion on the foreshore has resulted in the exposure of sites, such as the Iron Age site at Goldcliff (*ibid.* 10).

Watercourses

The study area is bisected by several main river systems and their attendant catchment zones that ultimately discharge into the Severn; starting in the west and going eastwards, they include the Loughor, Clyne, Tawe, Neath, Afan, Kenfig, Ogmore, Col-huw, Thaw, Cadoxton, Taff, Rhymney, Usk and Wye (see Figure 4). As can be seen, the main river courses delineate the broadly north/south orientation of the valleys in the upland zone.

In terms of the orientation of the water courses along their entire length, those in the west are broadly aligned northeast to southwest and in the east northwest to southeast, giving a radial pattern with its axis located in the vicinity of Craig-y-Llyn (Crampton and Webley 1963, 326). Gower has a broad radial pattern of drainage, which is distinct and separate from the rest of the region. The determinative factor in the orientation of the flow of some rivers, such as the Trothy and Monnow in Gwent, is the alignment of faults in their vicinity (NRW 2015, 2).

Altitude

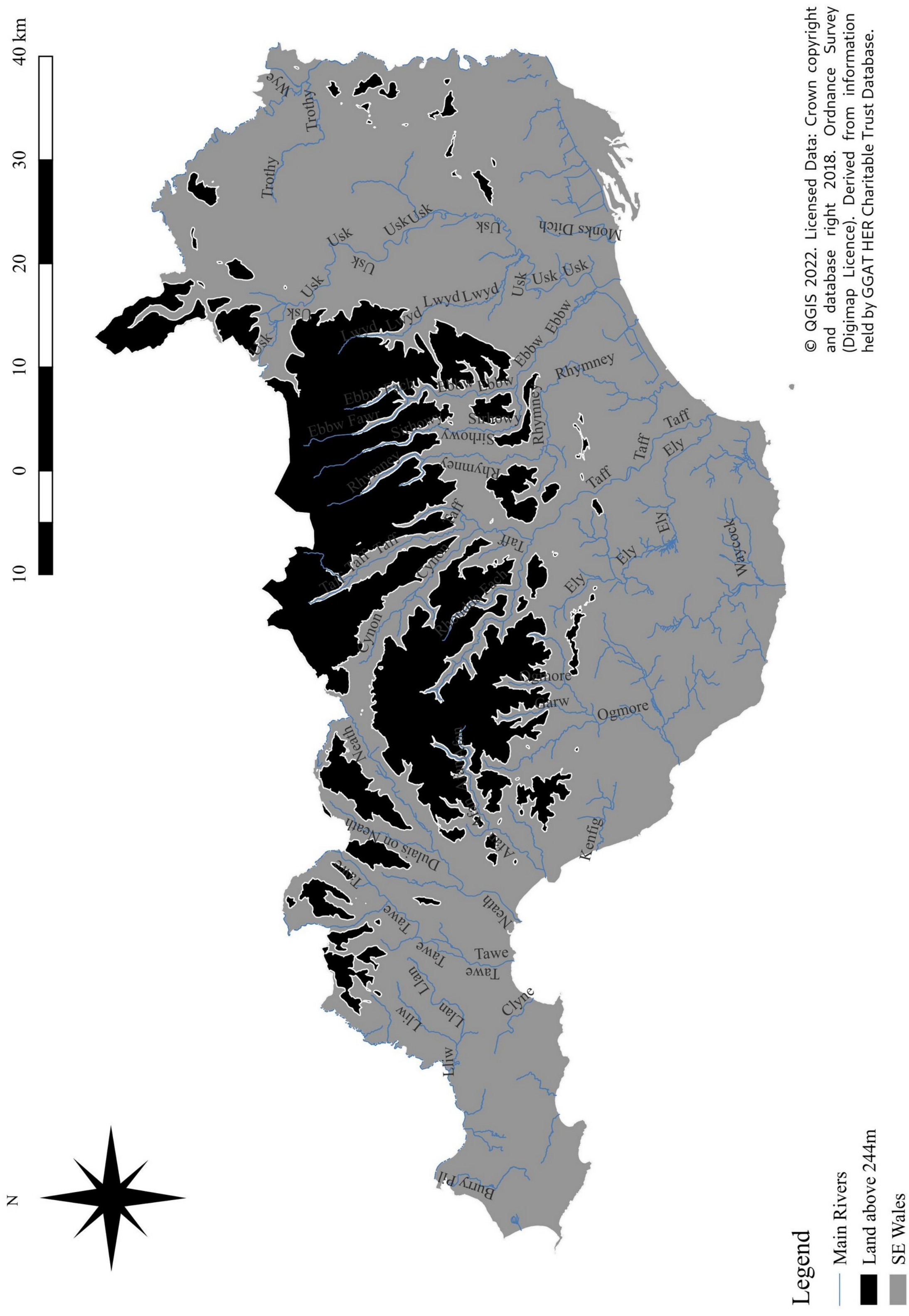
The region's altitude varies significantly, with a large proportion constituting an upland zone (see Figure 4). Timmins (2011, 81) adopted the boundary between lowland and upland areas as 244 m (Silvester 2003, 9), whilst Darvill (2002, 47) opts for 240 m, but a more flexible approach may be required to disentangle the various environmental effects on settlement patterns. The Institute of Terrestrial Ecology goes on to define land above the 250 m contour level as upland in one form or another. A considerable proportion of Wales, when considered as a whole, lies above the 244 m contour, in excess of 33%, (Silvester 2003, 9).

In certain parts of the British Isles, grazing would have been the principal form of agriculture practised in upland marginal areas. This is simply due to the dictates of a combination of factors, such as climate, topology and soil, as to the appropriate form of farming practised rather than being down to the discretion of individual farmers.

Bedrock geology

The study area's most significant single geological feature is the South Wales Coalfield Syncline. Several minor anticlines and synclines, such as the Pontypridd anticline and Gelligaer syncline, complicate this feature. The Coal Field Measures extend from just to the south of Swansea and accord, broadly speaking, with the upland areas of the region (see Figure 5). Its bedrock consists of siltstone, sandstone and mudstone, which are members of the Pennant Measures. Due to their similarities, the Millstone Grit and Coal Measures are often conflated into the more generic term of Upper Carboniferous

Figure 4: Map of southeast Wales showing land above 244 metres and main rivers.



(George 1975, 83). Topologically, the 'massive scarped slopes' are associated with the sandstones, as opposed to the softer shales (*ibid.*, 92).

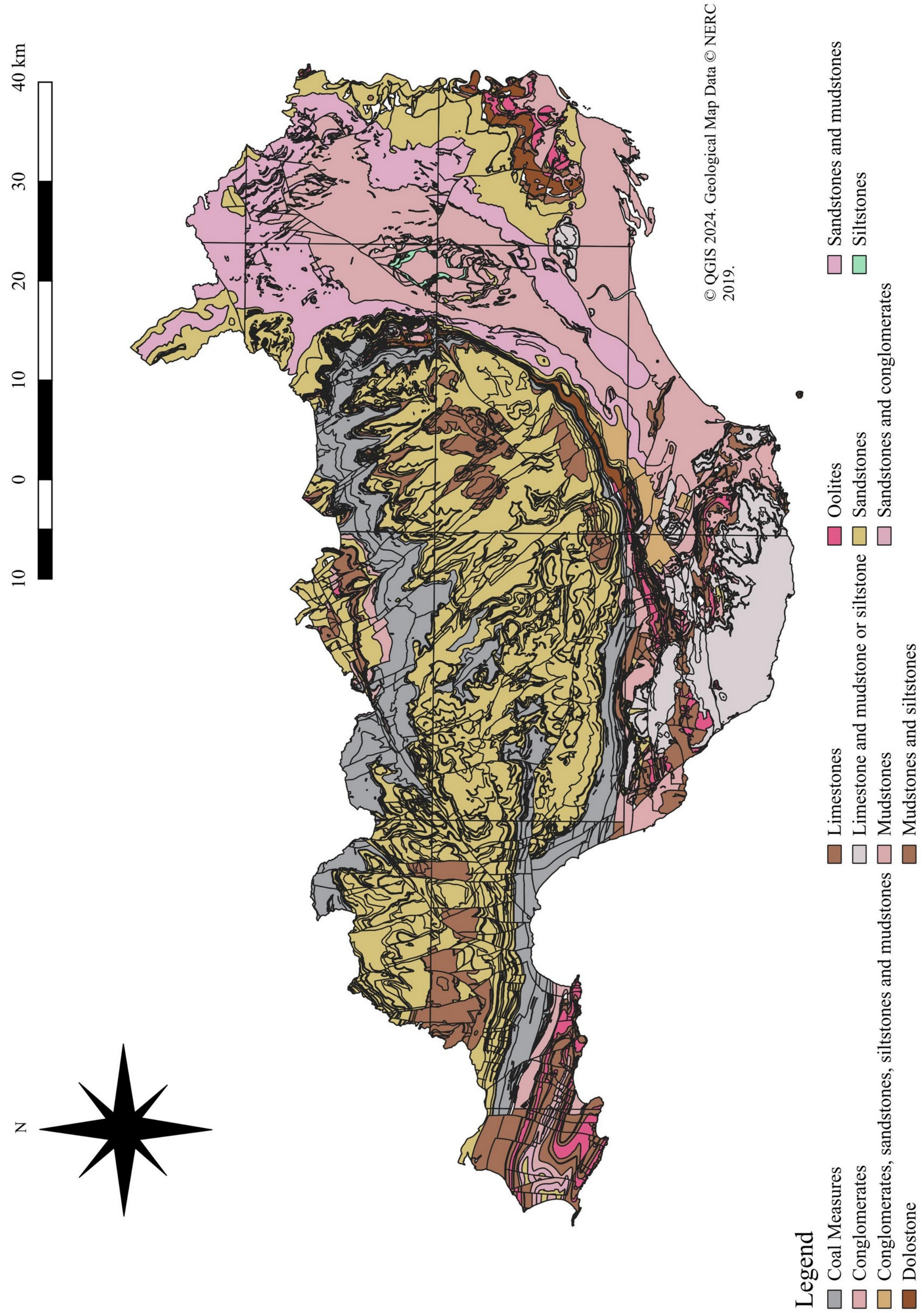
Millstone Grit encompasses the Coal Measures followed by a narrow strip, relatively speaking, of Carboniferous Limestone, which is then, in turn, bounded by Old Red Sandstone in the north and east of the region. This limestone extends in a band westwards, becoming increasingly narrow until it peters out to the south of Llantrisant.

The term Old Red Sandstone group can be misleading, as it includes some rock types that are sometimes neither red nor sandstone. Outcrops of Old Red Sandstone occur widely in both the Brecon Beacons and Black Mountains. They were formed during the late Silurian and early Devonian periods and deposited in the Anglo-Welsh Basin (Howells 2007, 99). Between the Coal Measures and Old Red Sandstone is an area of Silurian rocks that comprise the Raglan Mudstone Formation, which outcrop to the west of Usk (Pearson and Lewis 2003, 4 and George 1975, Simplified Outline Map of the Geology of South Wales).

Gower comprises principally of Carboniferous limestones, although Old Red Sandstone and Millstone Grit outcrop in places and were laid down in alluvial conditions during the Devonian period (George 1975, Simplified Outline Map of the Geology of South Wales). Lower Jurassic and Triassic rocks of interbedded limestone and mudstone predominate from Ogmore in the west to Penarth in the east. Whilst to the east of Cardiff, from the coastal margins in a northeasterly direction, marls (calcareous mudstones) predominate and fall within the definition of Old Red Sandstone, overlain by younger Mesozoic and younger, unconformity deposits.

Lower Carboniferous Limestone is also present to the north of the Levels, between Magor and the Forest of Dean, in the form of low hills (Bell *et al.* 2013, 7). On the eastern boundary of Monmouthshire, the Wye has cut through Carboniferous Limestone to form a broad, deeply incised gorge. To the west and north, between Newport and Cardiff, the Carboniferous Limestone is cut by valleys (ibid.). A broad band of

Figure 5: Simplified bedrock geology of southeast Wales



Carboniferous limestones, a down-folded structure in form, runs in a northeasterly direction from Magor. The Triassic mudstone underlies most of the Levels, with Lower Jurassic Lias outcropping to the north of Newport. The coastal margins (see Figure 5), including the Gwent Levels, are interrupted by Blue Lias, which comprises interbedded limestone and mudstone. This Blue Lias Formation (formerly known as the Porthkerry Formation) broadly extends from the eastern side of Cardiff to Bridgend and comprises interbedded limestone and mudstone.

Summary of the region's geology by area (NRW, National Landscape Character series):

1. Monmouthshire: A band of Old Red Sandstone encloses an area of Silurian argillaceous mudstones and shales (2015, 2 and 6).

2. Wentwood and Wye Valley: Devonian sandstones and Carboniferous limestone in more southerly areas (2014a, 2 – 3 and 7 – 8).

3. Gwent Levels: Red siltstones and mudstones dating from the Triassic but dominated mainly by superficial deposits of alluvium (2014b, 2 and 8).

4. Cardiff, Barry and Newport: Mudstones, sandstones and limestones (2014c, 9).

5. Vale of Glamorgan: Limestone plateau, conglomerates, sandstones and siltstones comprising Old Red Sandstone (2014d, 2 and 8).

6. South Wales Valleys: Sedimentary Carboniferous rocks, including the South Wales Coal Measures and iron stone (2014e, 8 and 9).

7. Swansea Bay (Loughor to Merthyr Mawr): Limestone outcrops overlain with millstone grit; much of this area is also overlain with windblown sand and alluvium, obscuring the presence of the bedrock (2014f, 3 and 8).

8. Gower: Carboniferous Limestone plateau intersected by Cefn Bryn, a ridge of Old Red Sandstone. Millstone Grit separates coal measures to the NE (2014g, 3 and 7).

9. Wye and Usk Vales (Brecon): Mudstones, siltstones and sandstones dating from the Silurian period predominate, whilst the southernmost part of the area is typified by mudstones and sandstones from the Devonian period (2014, 2).

Glacial Activity

During the Quaternary ice ages, glaciation deepened and widened these valleys, creating the classic glacial appearance of this landscape. Virtually the entirety of the coalfield area was subject to glacial activity (Crampton and Webley 1963, 327). Glacial activity, as evidenced by the presence of steep-sided U-shaped valleys, can be seen in the profile of the river valleys of the Ebbw, Rhymney and Taf in the east, whilst in the west, the Loughor, Tawe and Neath (George 1975, 127). Moraine is present on the sides of these valleys, and a number are blocked by moraines, with lakes forming to their rear, such as that at Llyn Fawr. Cirques can also be found at the head of many valleys and on the scarp face of the sandstone (*ibid.*).

Glacial erratics, originating in the adjacent upland areas within their associated river valleys in lowland areas, are also indicators of glacial activity (*ibid.,* 128). Moraine deposits can also be found in the lower reaches of many of southeast Wales' rivers, including that around Usk and the Llanfoist moraine south of Abergavenny. The landscape of Monmouthshire is largely governed by the glacial processes that took place during the Late Devensian (NRW 2015, 6). The Levels lay beyond the direct influence of glacial ice during the phases of glaciation in the Quaternary. However, lower sea levels precipitated the cutting of deep river channels (*ibid.* 2014b, 8). By contrast, Gower has been heavily influenced by glacial processes, including ice activity (*ibid.* 2014g, 8).

In places, raised beaches and platforms are on Gower, at the base of the adjoining limestone cliffs. These were formed due to the relative drop in sea level since the last glaciation and are approximately 6 to 9 m above the present high water level for the area (George 1975, 131). Other than alluvium, blown sand comprises the principal post-glacial deposit in south Wales and extends, broadly speaking, from Swansea Bay eastwards to Porthcawl (*ibid.*). Furthermore, along the south Wales coastline, below mean sea level, is the Submerged Forest Series, consisting of a layer of peat and tree stools *in situ* (Sherman 2011, 1 – 3 and George 1975, 131). The vegetative material in these strata consists of alder, oak, hazel and birch, which are part of the successional process, ultimately leading to a mixed woodland.

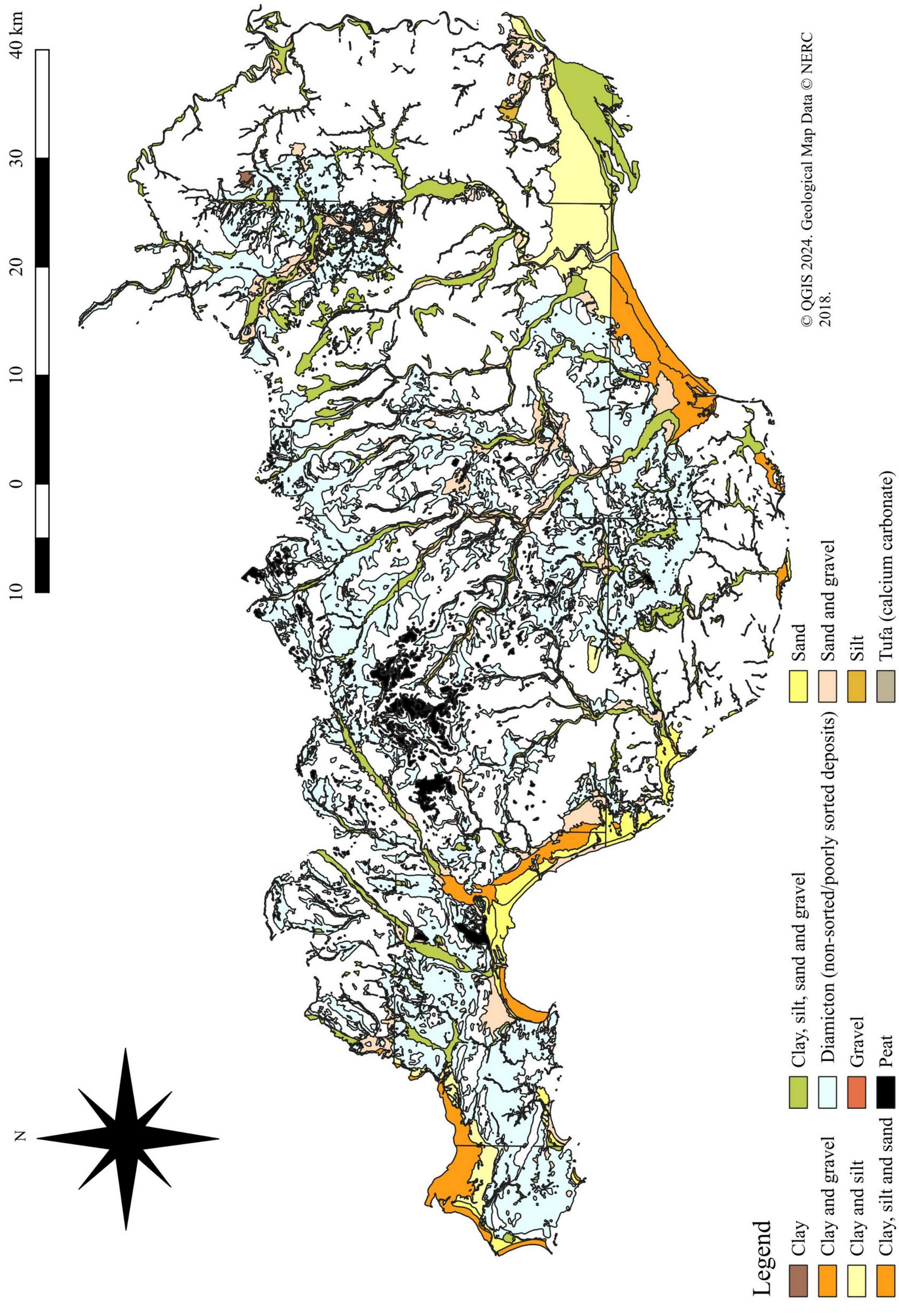
Superficial geology (drift)

Superficial deposits, formerly known as drift by the British Geological Survey, are very deep in the valley bottoms and cover the majority of the plateau area of Gower (Crampton and Webley 1963, 327). As detailed above, many of these superficial deposits, such as gravel terraces, result from glacial activity in southeast Wales. Such superficial deposits may have also influenced the choice of settlement location in prehistory. At Redwick, such material was utilised as heated stones, sourced locally, and then used for heating water (Bell *et al.* 2013, 93 – 4). These pebbles were worn down by attrition but were readily available near the site.

In a broad line between Magor and Sudbrook are several gravel terraces of varying sizes on a bed of Triassic sandstone (see Figure 6). This eroded bed of sandstone defines the northern edge of the Caldicot Levels. Alluvial deposits also occur along the region's drainage basins to varying degrees. However, the most extensive deposits are on the Usk floodplain, near the Olway Brook and its tributaries. An area of higher levels of alluvium, comprising Old Red Sandstone debris and sandy alluvium, lies between Caerwent and Llanfair Discoed. Rising sea levels, prior to the erection of the seawall, has resulted in the deposition of sediment that is on average 10m in depth in the Levels (Bell *et al.* 2013, 1).

To the southwest of Bridgend and adjacent to the Ewenny River, there are significant wind-blown sand deposits in Merthyr Mawr Warren. These wind-blown deposits have severely constricted a significant area of the mouth of the Ewenny (Evans 2004, 3). Superficial deposits of blown sand, typified by the coastal strip around Port Talbot, then extend to Swansea. At this point, deposits of till (unsorted glacial deposits), formerly known as boulder clay, appear and then predominate on Gower. Deposits of sand and

Figure 6: Superficial geology of southeast Wales.



gravel extend up the valleys northwards with large areas of diamicton (non or poorly sorted sediment, sand or larger-size particles suspended in a mud matrix) present in the adjacent areas.

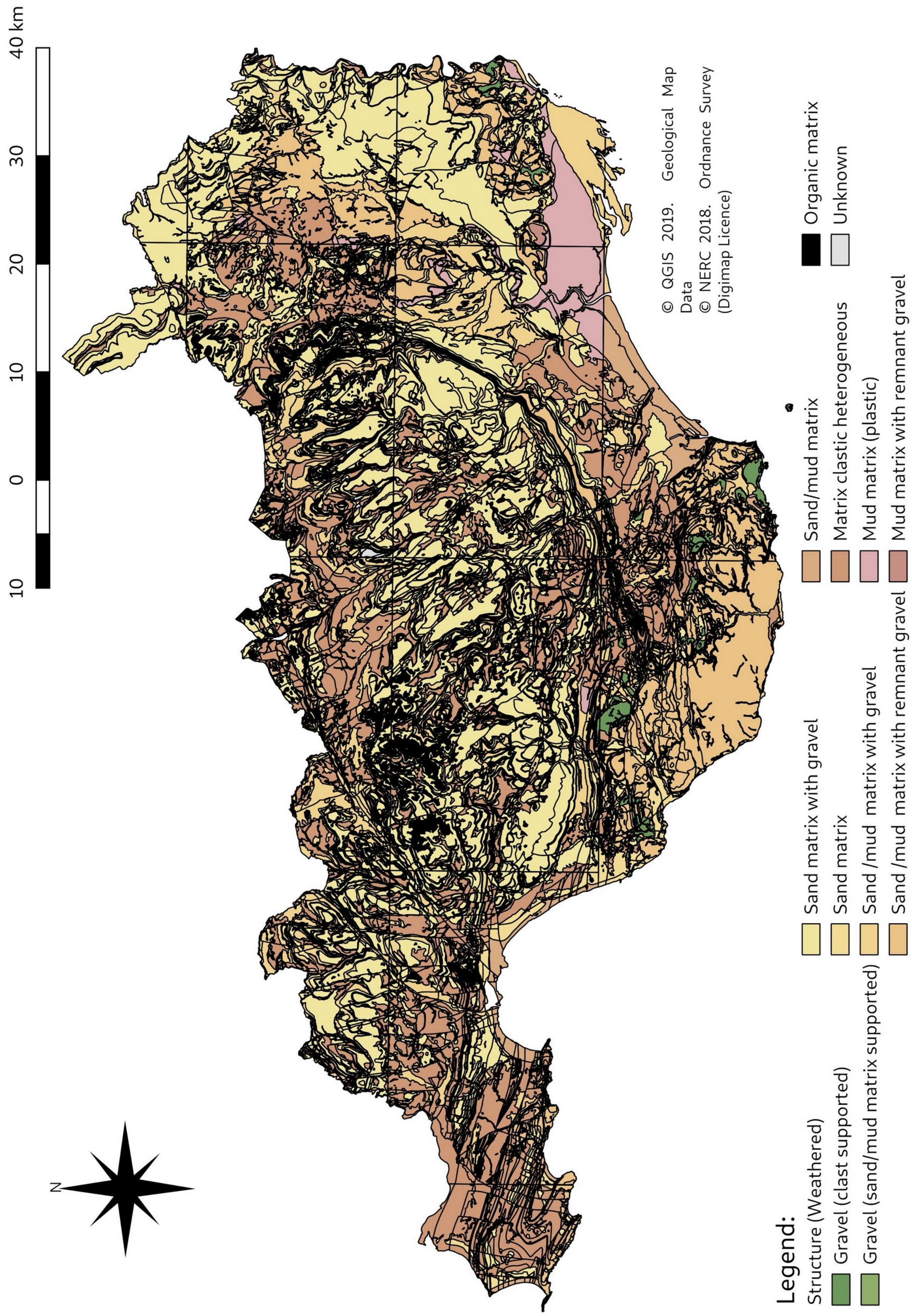
Region's soils

Those soils currently within an area may have been absent in the past. The soil descriptions utilised here are those used by the Land Information System on the LandIS Soil Portal, which utilises the World Reference Base for Soil Resources (WRB). The simplified soil triangle (see Appendix C) produced by the Department for Environment, Food & Rural Affairs (DEFRA) was utilised with the triangle's three points coinciding with sand, clay and silt loam, respectively. As one soil type progresses into another, it becomes increasingly clayey, silt loamy or sandy, respectively. The lighter soils are at the sandy and silt loamy end of the spectrum of soil types, and conversely, clayey soils are at the opposite end of this spectrum.

Glaciation, as detailed above, significantly influenced soil formation within the area. This glacial activity has led to the dominance of poorly drained soils, sometimes with peat present, above deposits of moraine (Crampton and Webley 1963, 336). Poorly drained soils are present in the flood plains of the main river systems, which include alluvials, gleys and stagnogleys, although adjacent to the Severn pelosols (clayey soils) predominate ((Jackson 1999, 8) see Figures 7, 8 and 9).

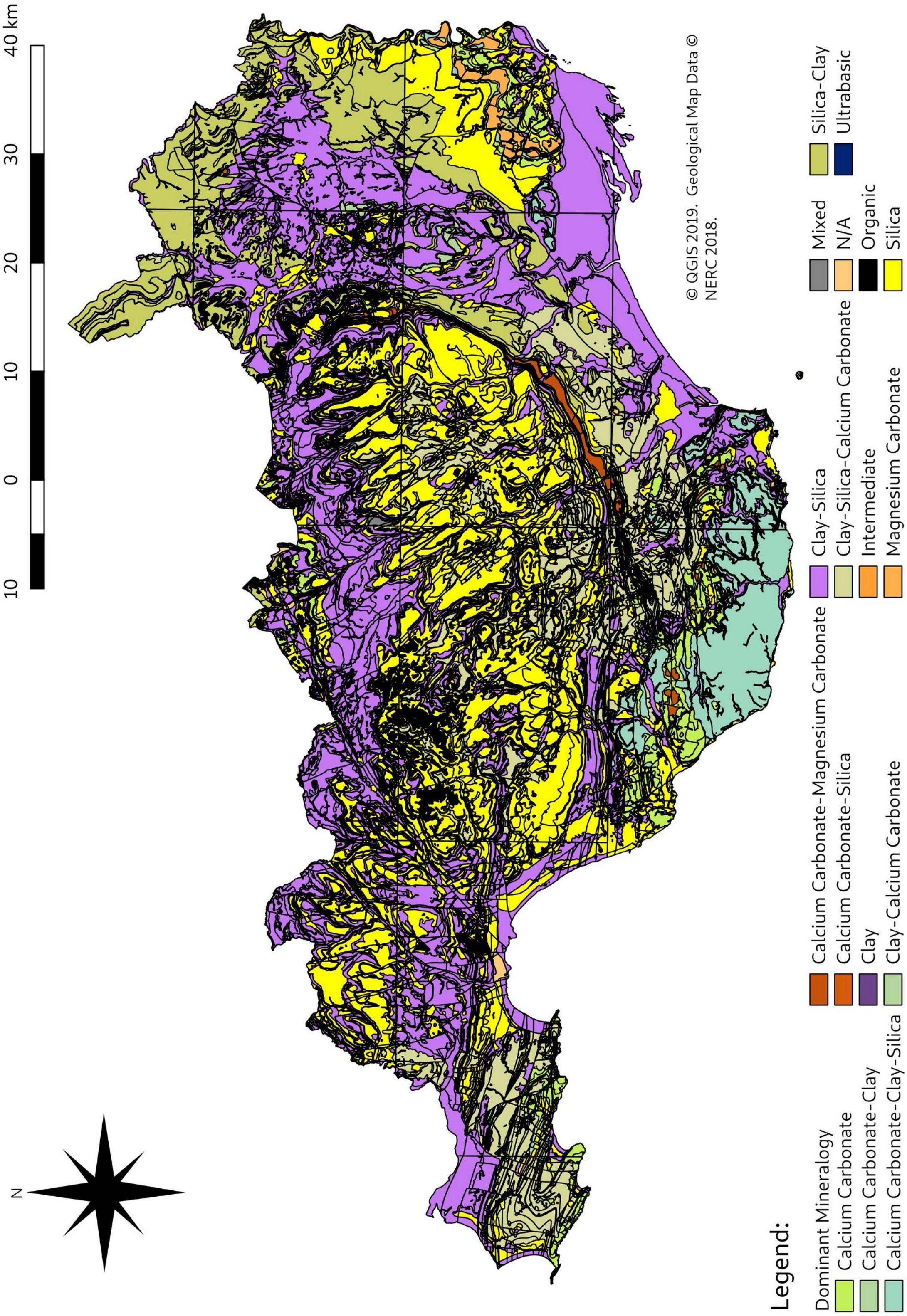
Podzols are typical in Ireland and the west of Britain (Allen 2017, 48) and are also present within the study area at higher altitudes with a sandy texture (see Figure 8). They are typified by a surface layer of peat, which results from poor decomposition due to the acid, wet and cool conditions prevailing in a given location (O'Hare 1988, 39 and Allen 2017, 48). These moist, cool, anaerobic conditions are not conducive to the decay of vegetative matter, which can then build up as peat. Below this, in marked contrast to the previous layer, is an eluviated horizon of greyey coloured bleached quartz (*ibid.*). Beneath this is the highly illuviated B horizon, where clays, organic materials and humus have been deposited (O'Hare 1988, 40). The LandIS Soil Portal (2019) describes

Figure 7: Soil structure (weathered) for southeast Wales.



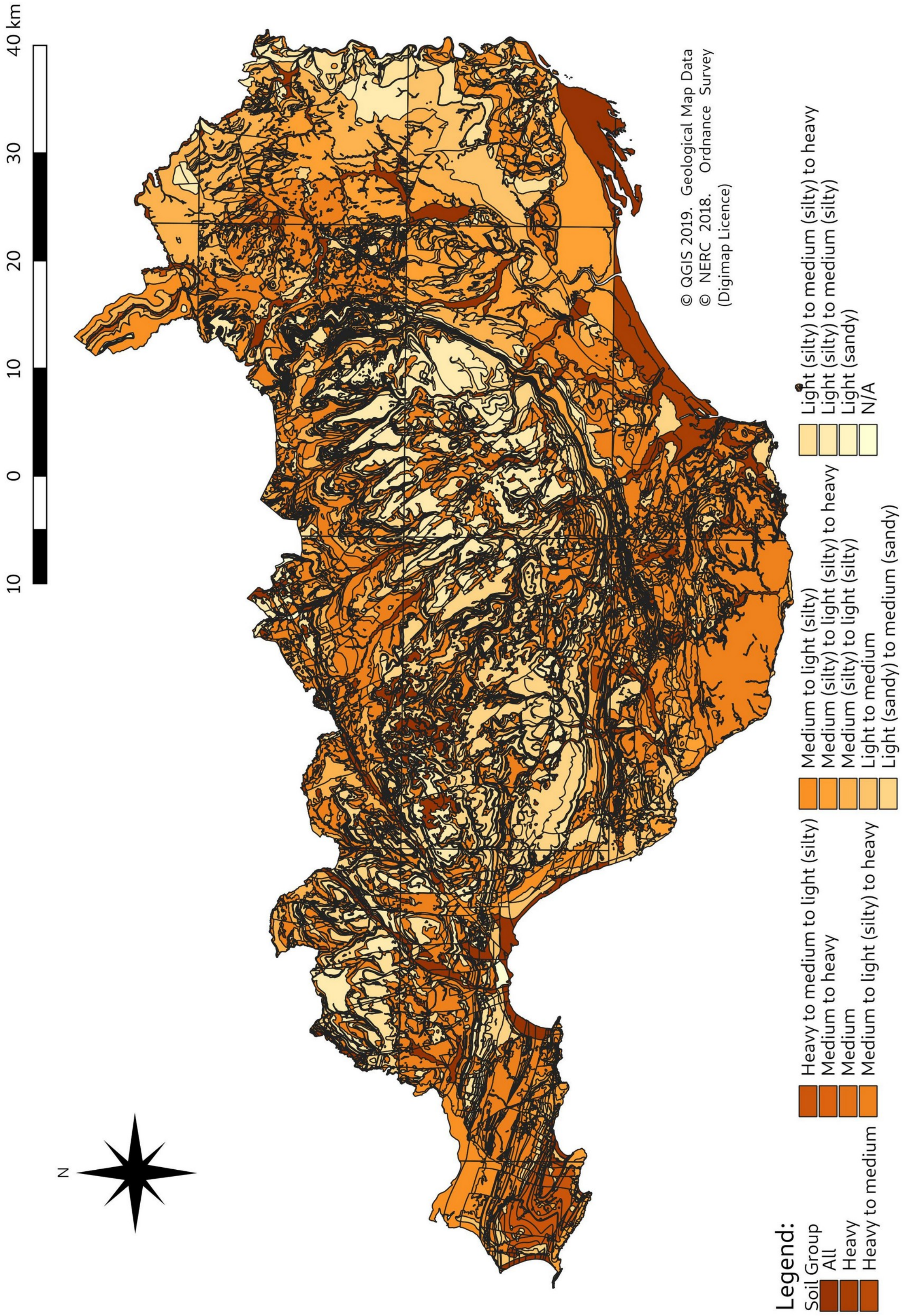
For a detailed explanation of the weathered soil structure types see Appendix A.

Figure 8: Dominant mineralogy.



For an explanation of the dominant mineralogy see Appendix B.

Figure 9: Soil group for southeast Wales.



For an explanation of the soil texture types see Appendix C.

this soil type as ‘Freely draining very acid sandy and loamy soils’. Soils in the region’s upland areas tend to the leached and acidic end of the spectrum of soil types.

Iron pans can form at the top of the B horizon in podzolic soils, at <10 mm thick, resulting from the aggregation of mineral grains due to the high concentrations of iron and humus (O’Hare 1988, 40). These iron pans can in turn lead to gleying due to the presence of an iron pan, which impedes drainage; this gives the soil profile a grey or red mottled appearance (*ibid.*, 42). Such soils are called stagnosols and described as ‘Slowly permeable wet very acid upland soils with a peaty surface.’ Should the drainage become impeded, for whatever reason, the soils can become gleyed.

The leaching of bases in podzolic soils into lower horizons is the cause of their acidity. They tend to be poor agricultural soils, suitable only for grazing or forestry. Even for grazing, podzols are not ideal, as the leaching of certain minerals, such as cobalt, can cause deficiency diseases in cattle (Hedeager 1992, 212). However, this is less likely to be a problem where the grazing is on a transhumance basis. Increased surface and sub-surface run-off also accelerate the process of soil erosion and leaching, thus further depleting an already marginal area of one of its few remaining resources. Crampton and Webley (1963, 335) observed that Bronze Age barrows are mainly present in areas of podzolic soils at 85% in Gower and 80% in Blaenau Morgannwg. It was also noted that Bronze Age round barrows are often located on freely drained soils at or near the junction with poorly drained ones (*ibid.*, 336). They do not, however, refer to the soil type beneath such monuments, which could differ from the soil surrounding them. Such a potential disparity could indicate whether the soil type has changed since the Bronze Age and assist in determining the prevalent soil type for the period.

It should be noted that Crampton and Webley (1963, 327) refer to ‘*sol brun acide’,* derived from the French soil classification system. Such soil would be classed as umbrisol under the WRB classification scheme. As the French classification implies, they are an intermediary between brown earth and podzol, although they tend towards higher acidity levels than brown soils. Brown podzolic soils can only be farmed for modern arable purposes by ploughing to mix the layers, liming and fertilising (O’Hare

1988, 42). Such soils may not have been so depleted in later prehistory, post-clearance, or farmers' yield expectations so high either. These brown podzolic soils are concentrated on the south side of the coalfield, particularly around Craig-y-Llyn (*ibid.* 329). Brown podzolic soils then give way to more clearly defined podzols as the altitude increases, but can also be found on the higher parts of Gower above Old Red Sandstone.

The Levels fall within the Newchurch 2 series, defined as "Deep stoneless mainly calcareous clayey soils. Groundwater controlled by ditches and pumps. Flat land. Risk of flooding in places" (Cranfield University 2021), which defines the prevailing conditions in the Levels rather well. Rippon (1996, 5) describes the soil here as brownish-grey, composed of friable silty clays that become greyer and less friable with depth. There is a degree of variability in this area in that the relatively higher areas have freer drainage and a more loamy texture, whilst lower lying areas are heavier due to the higher levels of alluvium present here (*ibid.*). These alluvial layers have been measured to a depth of c. 15 m around Newport, with only a narrow bed of gravel/sand between it and the bedrock below it (NRW 2014b, 8).

The Levels around Newport include 'Loamy and clayey soils with a naturally high groundwater' and, somewhat more extensively, 'Loamy and clayey soils of coastal flats with naturally high groundwater', both termed gleysols (see Figures 7, 8 and 9 (LandIS 2019)). Alluvial gleyed soils predominate in the Levels due to the poor drainage and periodic inundation by the estuary, being the main pedogenic factors involved here.

The coalfield, in terms of its soils, comprises 'Freely draining acid loamy soils over rock' in the valleys. The upland areas are 'Slowly permeable wet very acid upland soils with a peaty surface' in the eastern areas (*ibid.* (see Figures 7, 8 and 9)). Above the Lower Coal Series outcrop and Millstone Grit shales, peaty gleyed soils are common (Crampton and Webley 1963, 329). These peaty gleyed soils can also be found on Gower above the sandstone of the 'commons' (*ibid.*, 330 and 331). To the north and west of Treorchy, the conditions are conducive to bog formation, and blanket bogs have formed here (see Figures 8 and 9). Further north, the soils generally become 'Slowly permeable wet very acid upland soils with a peaty surface' (LandIS 2019). Due to the amount of spoil generated by the mines in places, the surrounding soils have not been classified in terms of the prevailing soil, such as the area to the west of Blackwood. The river valleys to the south comprise freely draining floodplain soils.

Most of Monmouthshire comprises ‘Freely draining slightly acid loamy soils’ or ‘Slightly acid loamy and clayey soils with impeded drainage’ (see Figures 7 and 9). On the higher ground to the north, the valleys consist of ‘Freely draining slightly acid loamy soils’. The Vale of Ewyas, along the adjacent mountain tops, is ‘Very acid loamy upland soils with a wet peaty surface’ with areas of gleying (*ibid.*). To the west of Monmouthshire, the soil types become more complex and discrete.

The Vale of Glamorgan’s soils comprise ‘Freely draining slightly acid, but base-rich soils’ with some areas of ‘Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils’ (*ibid.*). Pearson and Lewis (2003, 3) summarise the Vale’s soils as “…generally well drained silty clays and coarse loams,” whilst Crampton and Webley (1963, 335) note the near absence of podzols within the area. In summary, the Vale’s soils are silts or loams of a mostly well drained nature, although clays are present near water courses.

To the west of Ogmore-by-Sea to and including Gower are dune systems. Some consider that human activity in the Bronze Age had a role in forming and stabilising such dune systems, which are thought to have resulted from changes in vegetational cover (Bell *et al*. 2013, 316). Similarly, at Tofts Ness, Sanday aeolian erosion, in the form of sand blow, from the Late Bronze Age rendered the soil virtually useless for agricultural purposes (Simpson 1998, 98). What occurred at Tofts Ness may be analogous to what happened in southeast Wales with the extensive deposits of blown sand from Port Talbot to Swansea. A good example is present at Margam Burrows (see Figures 8, 9 and 10). These dunes were created when the prevailing wind blew onto the coast, picking up sand from the adjacent beaches and carrying it inland, where it is ultimately deposited and the belts of wind-blown dunes form (Allen 2017, 69).

Conclusion

As can be seen, the region's area covers a wide range of topologies, geologies and soil types. The geology of a region provides the source material from which soils are largely derived and forms the basis of the region's relief. Much of southeast Wales would have been tree covered early on in prehistory with the possible exceptions of the coastal margins, which were subject to marine inundation or were salt marsh and the very highest peaks. This extensive tree coverage would have precipitated the formation of brown earth soils with the build-up of the associated humus. The subsequent deforestation would have resulted in podzols forming in many upland areas over a sandstone substrate, as the soil would become eluviated. In certain locations, peat may have resulted from a climatic climax vegetational coverage of sphagnum and its associated plant species, whilst in drier areas, heathland may have resulted, particularly when combined with anthropogenic influences.

The region's relief can be divided into topographical areas: the upland environment, including the coalfield and the Black Mountains, undulating agriculturally rich lowlands, and coastal margins. These geographical parameters would have influenced how the various areas were occupied and farmed in later prehistory. Some associations between topography and occupation may be less straightforward in that they relate to aspects such as prominence in the landscape or intervisibility, which outweigh other factors. The nature and extent of this will be explored more fully in subsequent chapters.

Chapter 3: A review of the current position, climate change and key concepts

Introduction

In reviewing work derived from the region and geographically broader texts, including the British Isles and northwestern Europe, it was possible to highlight some of the issues that earlier authors had not resolved. For example, the effect that differing environmental zones may have had on settlement patterns in southeast Wales. Furthermore, it allowed for the testing of a number of hypotheses that had been generated previously with the application of various GIS techniques to the dataset. The absence of a chronology is a common theme amongst researchers in later prehistoric Wales and could not be resolved by this paper, although recently inroads have been made in this area.

Understanding the nature of later prehistoric people's cultural tool kit allows one to determine how an area may have been occupied both spatially and temporally, i.e. transhumance, shifting or permanent. It also allows one to understand the nature of that occupation in terms of its exploitation for either pastoral or arable purposes, albeit some form of mixed agriculture would probably have been practised over much of the region. The balance between the two will likely have shifted dependent on the prevailing environmental conditions. For example, certain crops or livestock may have been better suited to certain zones; for example, the Levels may have been less than ideal for sheep grazing or the sowing of cereal crops. How the region was exploited will assist in developing a narrative of how the region may have been structured in later prehistory. Given the scale and monumentality of hillforts, they also featured in this structural narrative.

Climate, altitude, water and soil type are all key factors when considering how an area has been occupied/exploited. The subtle interplay of these factors and how they influenced settlement patterns in later prehistory requires an in-depth analysis of the available datasets. In terms of the region, the evolution of its landscape, concerning its soils and vegetational coverage, is again a reflection of the prevailing climatic conditions at the time, farming practices and the underlying geology. Some authors, such as Burgess (1985, 195 – 230), have suggested that a climatic downturn had a direct impact on the occupation of upland areas in that it resulted in significant depopulation.

Other regional studies

Olding's (2000) report '*The Prehistoric Landscapes of the Eastern Black Mountains'* considers land use, settlement, economy and ritual activity. A later publication, Makepeace's (2006) report *'The Prehistoric Archaeology of Settlement in South-East Wales and the Borders',* provides a detailed study regarding settlements in this area. Both have a remit broader than this study by incorporating prehistory as a whole for the region. Both have a remit broader than this study by incorporating prehistory as a whole for the region. As they are so broad, it makes comparative analyses difficult due to the very different cultural/technological attributes of the various periods. These permitted the exploitation of differing environs, that is farming in the Neolithic and hunter gathering for the Mesolithic; though the difference may be one of emphasis particularly for transitional periods.

The presence of finds and ritual elements within the landscape are not necessarily indicative of the proximity of settlements. However, as Pryor (2010, xv) asserts, concerning prehistoric and historic, "…people's beliefs, hopes and aspirations were as important to them when taking decisions as were purely practicable considerations". Though this may be the case, it is hard to imagine that certain factors would not have been considered, such as proximity to water, absence of flooding, presence of productive soils and altitude. Indeed, in its most extreme form, the environment could preclude habitation altogether or only allow for seasonal occupation, as practised in transhumance. Bell *et al.* (2013, 326) indicate that the occupation of sites in the Levels may well have been on such a seasonal basis and draws on evidence derived from stable isotopes to come to this conclusion. Carbon and nitrogen isotopes, taken from the teeth of sheep/goats and cattle, support this hypothesis, suggesting salt marsh grazing. Such transient occupation of sites may mean that structures will not be evident at the surface, in the Levels, and excavation is required to determine occupation.

Another assertion made by Makepeace (2006, 39) is that the distribution of Mesolithic material is linked to the presence of water; this is questionable due to the abundant presence of watercourses throughout the study area and the absence of any statistical analysis to corroborate this. Indeed, similar comments are made about the significance of the majority of Mesolithic sites being located between 400 and 550 m OD in this area, which in part is predominantly mountainous, without the appropriate statistical techniques being applied.

In order to extract more accurate interpretative hypotheses from the available data, a clear definition of what constitutes a settlement is required. Limiting the study to later prehistory should eliminate some disparities associated with differing technologies facilitating the exploitation of a broader range of environmental niches. However, any such assertions should be statistically valid and appropriately tested. To differentiate between periods may prove difficult; for example, unenclosed huts once ascribed to the Bronze Age may date to the Iron Age. If this premise is accurate, it could address the absence of such evidence for the Iron Age. In any event, Makepeace (2006, Chapter 5) relates all such sites surveyed to the Bronze Age despite the absence of dating evidence (Mullin 2007). Such paucity of dating evidence will render any assessment of settlement change through prehistory potentially impossible. Additionally, the reliance on form to ascribe a site to the Bronze Age in Wales is questionable, although well dated examples can be found in the north and southwest of England (Lynch 2000, 91 and Mullin 2007). Regarding the Early Bronze Age, Hamilton (2004, 95) considers that their *"… ambiguity of form and context…"* and that they are mainly found beneath burial mounds or under ritual sites is cause for caution. It is proposed that this implies the remains are either somewhat ephemeral and, with such protection generally, they would be more common or that they were never dwellings but of a ritual association.

A shortcoming of both Makepeace and Olding's work is that their respective study areas exclude the wetlands adjacent to the Severn. As such, this precludes a comprehensive analysis of available geographical parameters and their impact on settlement or land use. In the case of Makepeace, a relatively limited area of the southeast of Monmouthshire is included which, due to its limited spatial extent, cannot be considered representative of southeast Wales. A more holistic approach can be achieved by including the upland areas to the north of the estuary, as proposed in this thesis. Indeed, Cooney (2001, 26) refers to the complementarity of evidence obtained from differing landscapes in the Bronze Age, referencing Ireland, though this premise is equally applicable to southeast Wales, as the area includes a range of environmental zones, such as upland, estuarine and lowland. Bell *et al.* (2013, 332 – 5) view the Severn as a unifying feature in the Bronze Age by acting as a means of communication instead of acting as a barrier. Intertribal communication would have occurred around the Severn as it would have facilitated inter and intra regional trade. The Caldicot boat fragments clearly demonstrate that such a premise was entirely feasible at the time (Hamilton 2004, 106).

Chronological Issues

The absence of a chronology and material culture limits our understanding of settlement patterns for the first millennia BC for much of the British Isles (Moore 2007a, 260). From the perspective of potential sources to develop such a chronology, Burrow's (2018, 107) observes that Wales has plentiful sources of dateable coastal surfaces and bogs in upland areas; as such, there are 1730 radiocarbon dates, of which 924 are from c. 200 pollen cores, from 419 sites. Therefore, the limitation is not one of a lack of available sources, but one of funding in order to ascertain the dates.

For southeast Wales, there are currently just eight radiocarbon dates, obtained from three hillforts, recorded in the literature (Davis and Sharples 2015, 9; and Gwilt 2007, 298). In terms of Cardiff and the Vale, again at the time of writing, there are three radiocarbon dates from Castle Field Camp (Davis 2017, 332). Additionally, there are 42 radiocarbon dates from just eight Iron Age settlement sites in the same area (*ibid.*). This paucity of dating evidence makes it difficult to draw specific conclusions concerning changes in settlement patterns over time. As the data is limited to just a few sites, it may also be unrepresentative of the region. This position is exacerbated by the fact that during the Late Bronze and Iron Age, there is only a limited presence of pottery for a significant proportion of Wales (Ghey *et al*. 2008, 2).

Penycloddiau hillfort, Denbigh in North Wales has produced six radiocarbon dates ranging from 1200 to 800 BC, which were taken from the hillfort's palisade and rampart (Research Framework for the Archaeology of Wales 2022, 14). These dates, in northeast Wales, form part of an increasing body of evidence for the early commencement of hillforts here (*ibid.*). Such early dates need not be universal in Wales, as evidenced at Castell Henllys, Pembrokeshire where construction commenced during the 5th – 4th centuries BC (*ibid.*). That said, Castell Henllys falls within Cunliffe's (2002, 74) 'strongly defended homestead zone' and is certainly peripheral to the 'hillfort dominated zone'. Falling within the 'hillfort dominated zone' though is Caerau hillfort dating from the Middle Bronze Age – Late Bronze Age, as opposed to the Iron Age (Research Framework for the Archaeology of Wales 2022, 14). If Caerau is representative of the region we may be looking at similarly early origins of hillforts here.

At Cwm George, also known as Dinas Powys hillfort, a new range of radiocarbon dates have been generated that have revised the chronology of the site (Campbell *et al.* 2023, 1555). Neolithic/Early Bronze Age activity, Phase 1, has potentially been associated with an open settlement located on the promontory and the Dinas Powys 'Southern Banks' ((Ty'n-y-Coed earthworks (*ibid.* 1557)). On the promontory, Phase 2 is of a Middle to Late Bronze Age/Early Iron Age context potentially enclosed by a bank. The pottery assemblage from the hillfort, previously linked to the Iron Age have now been reassigned to the Middle to Late Bronze Age (Jody Deacon, pers. Comm. in Campbell *et al.* 2023, 1559). Whilst sherds obtained from banks 1 and 3, with a slimmer profile and finger impressions, are of the Early Iron Age (Campbell *et al.* 2023, 1559 – 11). As can be seen there is body of evidence building up that supports the early origins of hillforts in Wales.

Non-intrusive methods can be utilised to analyse the interrelationships of settlements and their hinterland. The primary limitation of this approach, however, is that without subsequent excavation to date a site, any date would be reliant on comparing similar excavated structural forms. A cautionary example of this sort of reliance on type forms is the presence in the Gwent Levels of structures from the Middle Bronze Age to Iron

Age that have a rectangular form, as opposed to the roundhouse tradition, which predominates elsewhere in the British Isles (Bell *et al.* 2013, 154 – 62). Invaluable data can be obtained from non-intrusive surveys of cropmarks, as demonstrated in south Ceredigion and some hillforts of the Clwydian Range, as such, typology had to feature strongly (Review of the Research Framework for the Archaeology of Wales, 2004). In short, this thesis relied on the period allocated by the HER unless it became apparent that the given period was incorrect.

Marginality

In discussing the environment and its impact on settlement location it is necessary to define, or at least give parameters, to the term marginality. The relevant dictionary definition of marginal is "…(of land) difficult to cultivate and yielding little profit; close to the limit…" (Sykes, 1985), which captures the meaning to be conveyed in this thesis. A deleterious change in any one of a number of environment parameters can lead directly to the economic marginalisation of an area. An area can also cease to sustain a population, if there is an exigency in meeting subsistence requirements due to resource(s) failure, inability to harvest crops or both.

In some cases, marginality maybe due to technological limitations or just human perceptions (Edward and Whittington 1998, 62). An environment can be marginal due to its topography, climate, soil, socioeconomic factors, perceptual or even on symbolic grounds. What still causes debate is the relative importance of certain factors as the primary causal constituent for change towards marginality and the structure of these changes as they cascade through an ecosystem (Coles and Mills 1998, viii). The approach to farming in a given landscape can also affect the degree of marginality. In certain areas, for example, arable farming may not be appropriate due to environmental constraints, but maybe suitable for free-range grazing. Though certain areas can be considered as inherently marginal, this is overly deterministic in its stance. People have settled in a wide range of habitats globally, and adapted both culturally and technologically to exploit a broad range of environments. Technological innovation, for example plough shares, can bring an area into sustainability from one of marginality. However, population growth untempered by technological innovation can marginalise areas, as soils become exhausted due to over exploitation and the land's carrying capacity compromised.

The hinterland between upland and lowland zones is thought to support larger populations due to the diversity in the agricultural resource base (Davies 1995, 676 – 77). Here, reduced yields could not be remedied by expansion and if, as some have claimed, there was a shift to pastoralism in some areas where more land is needed, this would have compounded the situation further. Pastoralism requires significantly larger areas to produce the equivalent amount of protein than arable farming. The increased reliance on grazing was probably a response to the environment's inability, in upland areas, to sustain arable farming. Marginal upland areas are the obvious place to look for environmental and climatic deterioration, though lowland areas may be subject to inundation by flooding, river erosion or both (Manley 1989, 112).

Climate change in the British Isles and northwest Europe in prehistory

The end of the second millennium BC is followed by a period when the climate is believed to have deteriorated dramatically in northwestern Europe and the British Isles. The changing climate is then purported by some, such as Burgess (1985) and others, to have had a deleterious effect on the extent of settlement during the period. This premise assumes a direct correlation between the changing climate and settlement patterns, such as that proposed in environmental determinism. By correlating the evidence for the prevailing climate and comparing it with changes in settlement patterns for the same period, it should be possible to determine what, if any, influence climate has had on settlement patterns. Due to the absence of an absolute chronology for southeast Wales this is currently impossible.

A summary of the data from bog surface wetness (BSW), alluvial data and tree ring data is available in Table 1. There are notable differences in the sources, but this could be explained by the fact that the tree ring data is for northern Europe as a whole, whilst the BSW derived data is from northern Scotland. The Scottish data should reflect more precisely the locally prevalent climatic conditions, as opposed to the more generalised northern European data set. It is likely, however, that the dating of these climatic

Table 1: Summary of climatic variability from the Bronze Age through the Iron Age taken at differing geographical scales.

Approximate date	**Proxy source utilised and nature**	**Inferred climatic conditions**	**Geographical extent of the evidence given**
2354 BC	Ice cores containing evidence of a volcanic eruption and tree ring width	Climatic deterioration	Global
2300 – 2000 BC	Bog surface wetness (increase) and alluvial record (high activity)	Cold/wet	Britain
2000 – 1800/1500 BC	Bog surface wetness (reduction) and alluvial record (low activity)	Period of stability with a possible reduction in wetness	Britain
2300 – 1700 BC	Tree ring width	Dry and warm	Northern Europe
1700 – 1500 BC	Tree ring width	Period of cooling	Northern Europe
1800/1500 – 1200 BC	Bog surface wetness (increase) and alluvial record (low activity)	Wetter	Northern Scotland
1500 – 1430 BC	Tree ring width	Period of warming	Northern Europe
1400 – 1230 BC	Tree ring width and glacial expansion in the Alps	Colder wetter period	Northern Europe
1200 BC	Lakeside settlement abandonment	Wetter due to rising water levels.	Northern Europe
1200 – 850 BC	Bog surface wetness (decrease) and alluvial record (low activity)	Warm/dry phase	Northern Scotland
850 – 650/550 BC	Bog surface wetness and alluvial record (increased activity) and alluvial record	Cold/wet phase	Evident across Europe
650/550 – 400 BC	Bog surface wetness (decrease) and alluvial record (reduction but not to the same extent as previous periods)	Dry shift	Britain
500 – 0 BC	Ice cores	Cold/wet phase	Greenland
400 – 100 BC	Bog surface wetness (increase) and alluvial record (increased activity)	Cold/wet phase	Britain
200 BC	Glacial expansion	Colder wetter period	Global

(Sources: Campbell 2021, 64; Armit *et al.* 2014; Brown 2008, 8 and 12; and Burroughs 2007, 249) changes will continue to be refined with the utilisation of tephra layers within the peat and for proxy sources in general (Brown 2008, 9). Initiation of blanket bog growth varied by region after c.4000 BC, with a gradual increase in area, particularly in Wales, Ireland, and southwest England, peaking at c.1000 BC, somewhat later than other regions (Gallego-Sala *et al.* 2016, 133).

Tree-ring width-derived data for northern Europe indicates a dry and warm climate until c.1700 BC, which was subsequently followed by a period of cooling until 1500 BC and then a warming period for c. 70 years (Burroughs 2007, 250). More recent work has utilised BSW, a proxy measure that utilises humification, plant macrofossils and testate amoebae, a microscopic animal living on a peat bogs' surface. BSW indicate stability or a slight reduction in wetness, c.2000 BC to 1800 – 1500 BC, in northern Scotland (Anderson *et al.*1998 in Brown 2008, 8). A cold, wet period that commenced from c. 1400 BC to 1230 BC, with Alpine glaciers reaching extents not subsequently equalled (Burroughs 2007, 250). This cold, wet period correlates roughly with an increase in BSW for 200 – 300 years ending c. 1200 BC with a dry phase (Brown 2008, 8). Turney *et al.* (2016, 2 and 13) observe that "…a sustained period of extreme wet conditions…" started c. 1100 BC, when relying on Irish bog oak evidence, broadly coincident with deep-sea sediment records that indicate a transition to colder sea-surface temperatures in the North Atlantic (Burroughs 2007, 250). Such a change could be due to the Atlantic Meridional Overturning Circulation shifting southwards from northwest Europe towards the Iberian Peninsula, but the reason is not specified.

The dry period is followed by a cold, wet period that starts c. 800 – 750 BC with an increase in BSW and lasts for approximately 200 to 400 years (Brown 2008, 8). The causal mechanism is assumed by many to be caused by solar forcing, i.e. changes in solar radiation, associated with a significant wet phase across northwest Europe (*ibid.*). The bog surface wetness was compared with the production rate of ^{14}C and solar activity like the Homeric Minimum, a period of low solar activity (850 – 550 cal. BC). A subsequent return to drier conditions followed this cold, wet phase, which in turn is followed by a wet shift c. 400 BC (*ibid.*). In support of this, Bell (1995, 146) states that for the first half of the first millennium BC, i.e. the Sub-Atlantic Period, precipitation increased, and overall temperatures declined, as evidenced by the changing ratio between ^{18}O to ^{16}O in the Greenland ice caps.

Irish pollen evidence from Red Bog, Co. Louth and Littleton Bog, Co. Tipperary, which has since been corroborated elsewhere, points to a period of agricultural expansion in the Late Bronze Age and a subsequent decline during the Iron Age (Raftery 1994, 122). Darvill's (2002, 108) observation that the climate of the British Isles, towards the middle of the second millennium, was conducive to expansion into marginal areas with poor soils and upland areas, in general, seems an over-simplification. Such marginal conditions, in terms of settlement, are those that are approaching the threshold by which viable occupation can occur (Campbell 2021, 67). Nonetheless, it would not preclude seasonal occupation of these areas and therefore does not necessitate total abandonment. This period correlates roughly with an increase in BSW for 200 – 300 years ending c. 1200 BC (Brown 2008, 8). However, it is a fast developing field of research, and it is probable that a greater temporal resolution for climate changes during this period will be obtained. Such sweeping generalisations, do not allow for a detailed analysis of the effects of climate on settlement patterns.

Climate change and its potential impact on settlement in prehistory

During the 1980s and early 1990s, a catastrophist school of thought tended to predominate amongst archaeologists, best epitomised by Burgess (1985, 195), who stated that:

> Evidence of this disaster [climatic downturn] is seen in upland and lowland alike in the abandonment of agricultural systems and a dislocation of settlement, cultural and burial traditions.

It was argued that climate change, exacerbated by disease, was the cause of an apparent disaster (*ibid.*, 196). Such a disaster would point to profound changes in the socioeconomic structures of the period coinciding with a large-scale realignment of the population. The communities' needs would also appear to have changed markedly at this time, and Burgess considered that the abandonment of moorland in the Scottish Highlands and Islands, occurring in the Late Bronze Age, was as a result of this downturn in climatic conditions (*ibid.*, 201). Single axe finds from the various metalworking traditions were thought to indicate a sharp decline in the circulation of metal. This decline in circulation is said to have resulted from the fall in population from 1500 BC to 600 BC in northern England, Wales and the Marches (*ibid.*, 205). However, the axe finds that Burgess used to substantiate his theory would have needed a sufficiently robust temporal resolution for him to have come to these conclusions. Additionally, such artefacts may indicate a transient population rather than a permanent one. However, the premise still carries some weight, but the analysis is flawed, and the impact on later prehistory probably overstated (Campbell 2021, 61).

As Aston (2002, 19) observed, relatively minor alterations in temperature or precipitation, barely perceptible by resident populations, can alter how people utilise the landscape. A drop in the mean temperature of nearly 2 °C has the potential to reduce the growing season by several weeks (Burgess 1985, 200; Manley 1989, 110; Lamb 2005, 186 and 212; and Karlén and Larsson 2007, 409) and for an agrarian economy, already in a marginal area, this could be catastrophic. Agricultural viability would, therefore, have been substantially reduced in these areas with climatic deterioration. Relatively dry periods could have reduced an area's potential for pasturage, as water is often a limiting factor. Conversely, cereal harvests suffer if there is too much water, as they fail to ripen and are more susceptible to disease (Hedeager 1992, 208). However, much of southeast Wales is not marginal except for the area adjacent to the Severn Estuary and upland areas.

The premise of population growth and collapse is Malthusian in its fatalistic determinism. Malthus hypothesised that the human population increases geometrically, but food production only increases arithmetically (Sachs 2008, 38). In time, the population exceeds subsistence and is followed by a demographic collapse instigated by war, plague, famine or a combination of the three *(ibid.)*. Archaeological thought reflected contemporary negative Malthusian views about population growth in the 1980s. Baillie's (1998, 13 – 4) view of human populations, with the possible exception of some First Nation people(s), is that they take little heed of past environmental events and variations. Given the association with the extinction of megafauna, such as lions in Europe, with the arrival of people, this assertion is probably untenable. An alternative to Malthusian thought and a more optimistic hypothesis was that espoused by Ester Boserup (Morrison 1993, 116). Her view was that a growing population stimulates agricultural production, which meets the increasing demand for produce (*ibid.*). A more accurate hypothesis would probably lie between these two, apparently opposed schools of thought.

There has been a tendency to presume near constant population growth despite declining in the historic period due to famine, disease or both scenarios (Haselgrove and Pope 2007, 6). One such example, during the 14th Century AD, was a murrain, considered by some as rinderpest, that occurred between 1319 and 1320 in England and Wales (Campbell 1990, 100). These resulted in the failure of the harvest, 1321 – 1322, due to an absence of draft animals for cultivating the land (*ibid.*). Preceding this was the harvest failure of 1315 that resulted from a period of torrential rain and, ultimately, led to widespread famine in western Europe (*ibid.*).

This model of climatic deterioration followed by upland settlement abandonment was formerly the prevailing paradigm for many prehistorians (Coles and Mills 1998, x). Bell *et al.* (2013, 319) suggest that such earlier work was deterministic and rather catastrophic in its outlook concerning the impact of climate change, and that a more nuanced approach is starting to predominate. By 2001, concern had already been expressed about relying on a single environmental event to rationalise social change (Cooney 2001, 2). Nevertheless, some, such as Darvill (2020, 75) and Driver (2023, xiv), still espouse the narrative of climate change's detrimental impact on upland settlement resulting in abandonment. It should be noted that the impact of climate deterioration, at least in some areas of Britain, on people living at a subsistence level has been underestimated though (Haselgrove and Pope 2007, 6 and Pope 2003, 393).

Research by Armit *et al.* (2014, 17045 – 9) indicates that human activity in Ireland began to decline after 900 BC, with an acceleration after 800 BC, with the collapse of the Late Bronze Age population. Statistically, it was observed, by analysing testate amoeba-based water table reconstructions and humification records from peatlands in Ireland, that in 750 cal. BC, there was a marked shift to wetter conditions (*ibid.*, 17047). Somewhat later than the decline usually noted in England, which dates to the end of the Middle Bronze Age, not the end of the Late Bronze Age (Sharples per. Comm, 2016). It is concluded that the population decline is more likely to result from economic stress. This stressor event was considered to be brought about by the demise of hierarchical societies, resulting in social unrest. The demise of the longer trade routes required to produce bronze, rather than as a result of climatic decline that occurs at a later date than the initial decline in population, is thought to be responsible for the downturn in the population. It is conceded that deleterious climatic conditions would adversely affect farming, thus delaying population recovery and that this would have been exacerbated in more marginal areas. This view of socioeconomic or political factors initiating population collapse has been questioned, though it is considered that only improved dating will resolve the matter (Turney *et al.* 2016, 3).

It is probably a sweeping generalisation to imply the wholesale abandonment of the Welsh uplands and Dark (2006, 1391 – 2) correlates reduced agricultural activity in Wales for this period, but not abandonment. Evidence in support of this stance was obtained from 75 pollen samples, at altitudes in excess of 150 m above sea level, from across Britain, dating to c. 850 BC (*ibid.*). In eastern Wales, it has been purported, the climatic deterioration can be seen in the increased investment made in security by the construction of fortified villages in the Early Iron Age (Davies 1995, 672). It is proposed that such sites are more marginal and, therefore, have a greater susceptibility to climatic deterioration. However, this does not preclude a shift in agricultural emphasis to a predominantly pastoral economy. Nevertheless, evidence from the Brenig Valley, Denbighshire, points to continued occupation throughout this period (Caseldine 1990, 57). Pollen sequences imply a mainly pastoral economy in these areas of Wales, with some cereal production throughout the Bronze Age and Iron Age (*ibid.* 55). It should be noted that at Llwynypiod and Cwmcoddu such cereal type pollen only appears with the advent of the Iron Age (Rackham 2020, 162). On a cautionary note, cereal pollen does not travel far, and the role of pastoralism may be overplayed. Without a more detailed analysis, the subtle interplay of farming practices is currently unobtainable.

Davies (1995, 672) considered that what was important was the failure of many Late Bronze Age settlements, in both upland and lowland areas, to continue into the Early Iron Age. This stance, however, is not qualified evidentially and could be as a result of a problem in identifying Early Iron Age material culture. It may also reflect a failure to consider other aspects of a settlement, such as transhumance, or whether the area was occupied to any extent before the Iron Age. It has been suggested that this decline in apparent settlement evidence for the Iron Age is due to reduced population levels (Armit *et al.* 2014, 17045).

Peat formation

Increased precipitation combined with reduced evapotranspiration can either lead to gleying, peat formation, podzolisation or a combination of all three. The initiation and spread of peat, in northern Britain, occurred at varying rates and its initiation precipitated by a range of environmental factors from early on in the Holocene (Tipping 2008, 2097). At the interface between soil and peat can often be found evidence for later prehistoric occupation, which indicates that the activity of people combined with periods of fluctuating wetness may have precipitated the formation of peat in the British Isles (Campbell 2021, 65 and Bell and Walker 2005, 219). This position is not universally accepted though.

Blanket bogs are widespread in the west and north of the UK (Great Britain and Northern Ireland) and cover c. 6% of the land surface (Gallego-Sala *et al.* 2016, 129). Wales contributes c. 70,000 ha, to this area, which amounts to 4.7% of the total extent of the UK's blanket peat (Jones 2003, 95). Peats occur within very restrictive climatic parameters,

> Globally, blanket bogs occur where the mean annual temperature (MAT) > −1˚C, the mean temperature of the warmest month (MTWA) <14.5˚C and the ratio of mean annual precipitation to equilibrium evapotranspiration (moisture index, MI) > 2.1 (Gallego-Sala and Prentice, 2013, 152 and Gallego-Sala *et al.* 2016, 130).

Therefore, their genesis is considered to be set by the prevailing climatic conditions for a given area, as opposed to anthropogenic influences; a view taken by Tipping with regards the Scottish Highlands (2008, 2110). These climatic parameters limit the extent of their geographical distribution to the western margins and upland areas of the British Isles.

When combined with the presence of blanket bogs, in areas with very different land use histories, it would appear to indicate that their distribution is largely governed by climate (Gallego-Sala *et al*. 2016, 130). Formerly, it was considered that anthropogenic causes had a significant role to play in their inception (Gallego-Sala *et al*. 2016, 130). As such, climatic deterioration may have resulted in the formation of bogs and blanket bogs in southeast Wales. Between 800 and 400 BC, the raised bogs at Tregaron, Cardiganshire, Wales grew by nearly 1 metre, which is the equivalent of that for the entire two millennia following it (Lamb 2002, 137).

Particularly in marginal areas of peat inception, it has been suggested that the presence of people and their associated farming practises may have been sufficient to tip the balance in favour of peat bog expansion. Additionally, later prehistoric people's farming practises may have promoted an increased level of podzolisation and the leaching of soils, which in turn would then make subsequent re-occupation unviable. The importance of the subtle interplay of peat inception and people cannot be under-estimated. In the modern period peat bogs have, variously, been drained for the planting of coniferous trees and, conversely, drainage stopped up to increase water retention to aid bog regrowth. The former was to meet a perceived need for timber following the First World War and the latter, as a means of providing a carbon sink to mitigate against anthropogenically raised levels of atmospheric carbon.

With modern technological resources it is easier to facilitate such environmental change, but the impact of grazing and tree clearance in prehistory should not be underestimated, particularly in more marginal areas. It may be that anthropogenic influences merely speeded up the inception of peat formation, in prehistory, which would be a climatic climax vegetational type for certain areas, in any event. In the Welsh hills and Pennines, where woodland cover was declining, residential occupation and the herding of animals may have prevented any potential recovery, by the browsing of sheep or cattle, thus abetting the expansion of peat bogs. Without further research into this subtle interplay of geology, climate, topography and farming it will be impossible to discern what actually occurred.

Altitude as a factor

It should be noted that temperature declines with altitude and that the average environmental lapse rate is approximately a decline of 6.5 °C per kilometre (Anderson *et al.* 2007, 412, and O'Hare and Sweeney 1986, 81). Such an effect would equate to the temperature being approximately 4 °C lower within the study region's highest areas. Agricultural viability would have, therefore, been substantially compromised in upland areas with any deterioration in the prevailing climatic conditions. For a population becoming increasingly 'harvest sensitive', this would be a disaster as the land's carrying capacity was reduced (Burgess 1985, 198). Eking out a living in such marginal areas would become increasingly difficult. The result could be a state of overpopulation compounded by a contraction in the geographical limits of settlement. Whilst this premise has frequently been advanced, it has been observed that cereal production occurred in the Iron Age at elevations in excess of 350 m AOD at Mynydd Bach (Trecastell) and Mynydd Myddfai, although the high degree of pastoralism here should not be ignored (Rackham 2020, 163). Prior to the construction of the South Wales gas pipeline, the premise was that upland areas, for the Iron Age, were "...devoid of evidence of use..." and that such areas were used "...for rough grazing, if at all..." (Murphy 2020, 85). Mynydd Myddfai, Carmarthenshire, consisting of two roundhouses, was dated to the Middle Iron Age (*ibid.* 85 – 6). Dating evidence was also obtained from a test pit in the site's locale and charcoal obtained that was subsequently dated to the Early Iron Age (*ibid.*).

However, marginal areas may not have been abandoned totally, but transhumance practised. Locock (2006, 59), when referring to deserted rural mediaeval farmsteads in southeast Wales, considers areas may have only been occupied on a short-term basis, and to assume permanent occupation would be misguided. This premise may also be valid for the more marginal areas of southeast Wales during the Bronze Age and Iron Age. In many cases, conditions would have to be either catastrophically bad or subject to a prolonged period of prevailing deleterious environmental conditions to persuade people to abandon the permanent settlements in which they had so much invested (Campbell 2021, 66). This state of inertia to environmental change can be witnessed in modern societies. For example, where settlements have been constructed on flood plains adjacent to the coast, hard engineering solutions are sought to overcome the risk of flooding rather than abandon these areas.

Forest cover and woodland clearance

Before the Bronze Age in Ireland, Wales and Cornwall, woodland was present up to the Atlantic coast and higher on the hills than present (Lamb 2005, 137). This woodland is probably indicative of woodland climatic climax vegetational cover, which would have supported a different range of animal species from that present on moorland today. In the more mountainous areas of Scotland, the loss of trees may reflect a natural response to a deteriorating climate as more arctic type conditions prevailed. The British Isles, prior to any anthropogenic influences, would have been covered, in the main, by such forest, which coincides with Rackham's 'wildwood' (2001, 64 and 2006). According to Bell (1995, 150), woodland clearance was far more geographically widespread in the British Isles than on the continent during this period. Nevertheless, isolated parts of Wales and northern England would have remained wooded, although there may have been areas of woodland regeneration (Bell 1995, 151).

Farming significantly impacted this woodland, according to palynological evidence, after c. 2500 BC in the Welsh uplands (RCAHMW 2003, 22). This clearance continued and intensified into the Iron Age, which could be seen in the light of a growing population but may also reflect the wider use of extensive pastoralism. At Yscir, Powys, located just to the north of Pen-Y-Crug hillfort (Brecon), there is evidence of large-scale woodland clearance dated to the Middle Iron Age (Murphy 2020, 85). By the Iron Age, it is estimated that England may have lost 50% of its wildwood coverage, leaving the landscape denuded of its climax vegetational coverage (Rackham 2001, 72 and 2006). The palynological record for Wales indicates a move to a more open landscape towards the end of the Iron Age, which appears to have accelerated during the middle/late Bronze Age (Caseldine 2018). This should only be viewed as a generalisation though, as there were areas of birch regeneration throughout this period (Rackham 2020, 156 – 63). Clearance has been associated with the main period of hillfort use in Wales, again indicating the relatively intensive nature of human occupation in Wales during this period (Caseldine 1990, 67 – 92). As such, a rather complex picture of clearance and subsequent regeneration emerges in Wales, but with a general trend towards an open landscape.

Such fluctuations in the relative abundance of arboreal to non-arboreal pollen can indicate anthropogenic clearance and regeneration (Dark 2008, 1383). However, Dark (2008, 1383) goes on to say that such fluctuations may also arise from natural environmental factors, including climate change, the growth of peat bogs and alterations to the local hydrological conditions. Additionally, human activity might be an underlying exacerbating factor leading to such change. Population growth during the Middle Bronze Age likely forced settlement expansion into these generally more marginal areas (Darvill 2002, 127). The first significant clearances coincided with a period of climatic downturn, which, according to Dark (2006, 1391), implies increased land pressure, presumably associated with population growth.

Caution must be exercised when using pollen sources to imply anthropologically induced change as, for example, elm decline can be due to disease or may only be apparent, as leaves could have been harvested for fodder. Furthermore, as Caseldine (1990, 55 – 6) has observed, it is difficult to disentangle the interdependence of climate and vegetational changes. During periods of relative dryness, fodder from leafage is essential as it is less prone to the effects of drought than grass (Hedeager 1992, 202). Ash and elm leaves in northwest Europe were traditionally cut in summer for fodder and then dried for storage (Reynolds 1995, 205). As Caseldine (2018) observes, two responses to climate change might impact woodland cover: increased clearance to maintain harvests and, with particular reference to upland areas, abandonment leading to regeneration. A wetter climate could, however, have seen an increase in the levels of woodland clearance as there was a shift to pasturage.

Woodlands would have been coppiced to provide a suitable and plentiful timber supply for hurdles, wattle and daub walls, and fuel. In a pre-industrial society, timber would have been in great demand, and there is little doubt that woodland areas would have been carefully managed. Such areas would also have provided much needed pannage for pigs and browsing for cattle.

Vegetational evidence at the regional level

With reference to the Vale of Glamorgan and Cardiff, Davis (2017, 346) observes that the paucity of available pollen analyses here restricts what is known about agricultural practises for later prehistory. This is exacerbated by the fact that what work that has taken place has a propensity for upland areas, in Wales, and in the process further neglects lowland areas like the Vale (Davis 2017, 346 and Caseldine 1990). Palynological work has, however, taken place in the Levels and along the adjoining coast though (Bell *et al.* 2013, 282).

The Eastern Vale of Glamorgan Environs Project has addressed this shortfall, at least in part, with 6 pollen sequences taken from waterlogged deposits in the eastern part of the Vale (Davies *et al.* 2015, 164 – 5). Of the sites that could be radio carbon dated, Nant yr Argae, Wenvoe was dated to 773 – 518 Cal. BC (*ibid.* 165). At the level of analysis performed, a detailed commentary could not be produced of the prevailing environment around the cores' site though (*ibid.* 166). Notwithstanding this, from all of the pollen and spore samples taken 'cereal-type pollen' and weeds indicative of arable farming were present (Davies *et al.* 2015, 164 – 5 and Davis 2017, 346).

For the eastern part of the region, Bell *et al.*'s (2013) '*The Bronze Age in the Severn Estuary'* is an invaluable source of environmental data. Llandevenny, to the south of the hillfort at Wilcrick, on the northern edge of the Levels, constituted raised mire in the late Neolithic, whilst in-between the mire and the dryland was alder and birch carr (*ibid.* 281). Llandevenny's peripheral location makes it ideal for providing ecological information for the wider area. The dryland area here was densely "...wooded characterised by mixed deciduous woodland dominated by oak and hazel with elm, lime, ash, and sporadic beech"; although lime had declined as component of this mix by the late Neolithic, as evidenced by the decline in pollen sequence LL1 (Bell *et al.* 2013, 281 and Brown 2007, 254).

Archaeological evidence, for the late Neolithic or Bronze Age, resulting from anthropogenic sources is absent from the edge of the dryland at Llandevenny (Bell *et al.* 2013, 281). Nevertheless, macroscopic charcoal, in sequence LL4, implies activity in the later Neolithic on the mire, a view given further weight by the presence, albeit limited, of charred heather and Brome seeds (*ibid.*). The Bromus seeds, associated with grassland, could indicate human activity on the adjacent dryland (*ibid.*). Their presence may be due to grazing animals passing them in their in faeces, as they would not be growing on the mire (*ibid.*).

The potential for muirburn, dating from 2330 to 2040 cal BC, is evidenced at Goldcliff East and may reflect attempts at reducing the presence of heather in favour of grass for grazing (*ibid.*). A 'cultural' landscape is thought to have been present on the dryland, encompassing the Levels, from the mid to later Bronze Age. (Bell 2000, 337). The absence of cereal pollen in areas of clearance, 3100 – 2800 cal BC, is considered to be as a result of an economy primarily based on pastoralism (*ibid.* 2013, 281), whilst later clearances at Llandevenny, Goldcliff and Caldicot have been associated with 'cereal-type' pollen (*ibid.* 281 – 2).

At Llwynypiod (Ammanford), at 147 m AOD, indicators of pastoralism, such as grasses and plantain, and therefore clearance appear at about 1400 – 1300 BC with cereals perhaps in the Late Bronze Age (*ibid.* 157). From the mid-Bronze Age onwards, at Cwmcowddu (Carmarthenshire), there is evidence of the presence of heathland on the hillsides, presumably as a result of the soil deterioration here, and the subsequent colonisation by hazel and birch of upland areas that may have been abandoned (*ibid.* 161). On the western edge of the region at Tal-Y-Cynllwyn (Swansea), adjacent to the Loughor river at c. 11 m AOD and on the western periphery of the region, was an area that was densely wooded during the Late Bronze Age (Rackham 2020, 156). A small drop in oak and hazel, combined with an increase in grasses and the presence of cereal is indicative that clearance had commenced though (*ibid.*). Additionally, there is an increase in birch which could indicate regeneration or its establishment on the bog present here (*ibid.*).

The division of land and field systems

In the late third and early second millennium BC, more permanent settlements were developed, and the landscape divided into units, which could indicate an intensification of land use (Bewley 1994, 65 and Hamilton 2004, 95). However, Audouze and Büchsenschütz (1991, 166) view this not as a period of intensification of land use, that is during the mid-second millennium BC, but one of territorial expression. The Quarley linear boundary, Hampshire, was probably such a statement of territoriality (Osgood 1999, 8). Extensive linear features, indicative of boundaries and field systems, are a feature of Bronze Age England and can be seen in Dartmoor, Wessex and Yorkshire. Quarley Hill and Sidbury are located at the junction of several adjacent territories (Bradley, 2007, 248). The absence of such features in southeast Wales may reflect the use of significant geographical features as boundaries, such as the broadly north – south flowing rivers, and that, as a result, the spatial orientation of the region may have been different from that of southern England.

From 1700 BC, for a century, large areas of open landscape on Dartmoor were enclosed with stone banks upon which an earthen bank may have been placed in which a hedge was planted (Pryor 2010, 139). Dartmoor was divided by over 200 km of these reaves enclosing over 10,000 ha. (Dartmoor National Park 2004, 5 and Darvill 2002, 108 – 9). With the advent of wetter conditions, after 1000 BC, it is thought abandonment set in (Pryor 2010, 139). Of the c. ten blocks of land, there appears to be a conscious decision to include a variety of environmental types, for example, hillsides, valley bottoms and upland grazing (Bradley 2007, 210; Audouze and Büchsenshütz 1991, 166; and Manley 1989, 102). An alternative scenario is that reaves formed ranch boundaries for cattle or sheep (Bradley 2007, 210; Cunliffe 2004, 62; McOmish 1996; and Fleming 1988, 86). Instead of a system of land division inflicted upon the local populace, some see this as community led development (Giles 2013, 107 and Fleming 1988, 70). Farmsteads within this landscape system constitute either solitary roundhouses or groups with farmyards nearby (Pryor 2010, 141 and Manley 1989, 103). The smaller plots, adjacent to houses, were thought to have been used as allotments or for cereal production. These fields tend to have small curvilinear forms nearest the settlements, whilst further away they are larger and rectilinear.

Elsewhere in the British Isles, linear ditches and field systems, presumed to date from the Middle Bronze Age, indicate the subdivision of landscapes and involved a high level of cooperation (Moore 2007a, 264). Prior to this, clearance would have been in progress for several centuries, but this is one of the first visible monuments to it. Their construction indicates the combined efforts of a significant number of people to facilitate this and possibly some form of centralised political structure. However, the subdivision of the landscape does not preclude communal activities, such as ploughing, being undertaken when necessary (Karl 2008, 73).

Co-axial field systems are mainly found in northwestern Europe in countries that border the North Sea, for example, Britain, Denmark, Netherlands, northern Germany and Sweden (Audouze and Büchsenshütz 1991, 160). Recently, such field systems were considered Bronze Age in lowland England and not a significant feature of Iron Age agriculture practises (Bradley and Yates 2007, 94). The field sizes vary from 0.16 to 0.25 ha in extent and tend to be square as opposed to rectangular (Reynolds 1995, 181). Some have suggested that the enclosed area could be ploughed, probably cross-ploughed, in a day with contemporary equipment (*ibid.*, 188 – 9). Differential wear on 'ploughshares' indicates that ploughing was done in blocks and not strips, which tends to support the above hypothesis (*ibid.*, 178). However, technological constraints do not appear to have been the sole factor, as the same sorts of equipment was utilised in the Roman period in larger fields.

From c. 800 BC, along with other significant societal changes, there was a move away from field systems throughout Britain (Haselgrove and Pope 2007, 18 and Darvill 2002, 127). In the Midlands and Wessex, the construction of new field systems stopped in favour of long linear boundaries comprising a bank and ditch between 3 and 6 m across. These divide the land into larger units, which some consider is linked to the appearance of hillforts. The linear boundaries are often several kilometres long and can be sinuous, unlike the preceding field system; there is a distinct lack of evenness and regularity.

These changes reflect a shift in agricultural practices and land tenure; speculatively, it could be associated with cattle ranching and the concentration of land ownership, respectively. Bradley and Yates (2007, 98) consider the demise of co-axial field systems may have been due to the intensification of land use associated with the adoption of intensively farmed infields and the more remote outfields in northern Europe. Bell *et al*. (2013, 339), concerning Wessex and the late Bronze Age, consider the imposition of such linear boundaries to be associated with the wider adoption of pastoralism. The upland reeve system of Dartmoor is considered to either have fallen into disuse or were less intensively utilised (*ibid*.).

The hedge is perhaps the most effective field boundary for stock control, which complicates matters further in lowland areas. Within an archaeological context, the evidence for them is somewhat ephemeral, as the roots penetrate the soil only relatively shallowly (Pryor 1998, 71). The extensive field boundaries in the East Anglian Fens may indicate what may be present in the Gwent Levels, though currently there has been a dearth of such features here. However, as can be seen, small fields are not necessary for arable farming, and in any event such fields could feature within a dairying regime. It has been observed that such features are unnecessary for land management, and the alternative scenario is that the landscape was broadly open (Mytum 2018).

Alternatively, a tradition of common land is still practised in parts of Wales, for example, Bryn Arw to the northeast of Y Fâl, where enclosure is still absent on the mountain tops. Common land can also be found at lower altitudes adjacent to the Severn in the Levels. These remnant remains of common land could be indicative of areas that were formerly used seasonally. Currently, Bryn Arw is only suitable for rough grazing. Bell *et al.* (2013, 339) note the increased reliance on sheep during the late Bronze Age, which may explain the subsequent abandonment of field systems. Justification is not provided to qualify for this position, but it would be reasonable to assume they were free-ranged. Sheep are grazed to this day on upland common land, as the land is often of such poor quality as not to warrant the effort of enclosing it. The clipping of ears or branding would identify ownership of these free-ranged animals. Alternatively, hefting may have been practised whereby livestock are restricted to a given locale with continual shepherding (Lock 2023). Eventually, the livestock become habituated to an area and remain there without shepherding being required.

Bronze Age field systems have also been located at St. David's and Ramsey Island. Additionally, there may be evidence of early field systems subsumed under blanket bogs in the Welsh uplands. At about this time, many bogs show similar signs of peat growth horizons called the Grenzhorizont (Bell 1995, 146 and Raftery 1994, 36). Cooney (2001, 18) observes this in Ireland, at Carrownaglogh, Belderg, Cashelkeelty and Valencia Island, where evidence for field systems from the Mid to Late Bronze Age have been covered by bog. As such, there may well be evidence for such field systems under the bogs of Wales. On a note of caution, many upland areas in Wales had moorland and blanket bogs present, which predate the Iron Age in their formation (Bell 1995, 151).

Conclusion

Various factors such as forest clearance, ploughing, climate and topography will all have impacted the later prehistoric occupation of southeast Wales. The climate for this period was subject to considerable change over time, such as the wet period that lasted from c.750 cal. BC for between 400 and 200 years. Burgess, in the mid-1980s, had to rely on typology for his chronology, with all its inherent shortcomings, to correlate settlement change for the period with that of climate change. In the last 20 years, the temporal resolution of the various proxy measures of climate change has improved significantly (Brown 2008, 9).

The concept of climate change and its impact on human settlement patterns has been around for quite some time, although initially, it was rather deterministic and catastrophic in its application. A more subtle and nuanced approach is now prevailing, but the issue remains unresolved, with two recent papers, Armit *et al.* (2014) and Turney *et al.* (2016), coming to very different conclusions. Armit *et al.* (2014) consider the cause of depopulation economic, and Turney *et al.* (2016) climatic. What can be observed is the expansion of occupation into upland areas during the Bronze Age that would have been covered, for the most part, with climatic climax vegetation. The soils would probably have been brown earth that had developed under the tree cover following the cessation of glacial activity in the region. In the exposed, more marginal upland areas, soil fertility would have deteriorated over time with any increase in rainfall, such as that which occurred after c.750 cal. BC, which would erode the soils and eluviate out nutrients that had built up under the former tree coverage.

As can be seen, environmental change throughout the period would have had an impact on how people interacted with their immediate environment, particularly given a predominantly agrarian economy. The impact of climate change would likely have been more significant in marginal areas, but it is unlikely that it would have led to total abandonment, as stated by some. Far more probable, there may have been a shift to pastoralism in such areas and for the more extreme locations transhumance practised. Occupation of valley sides may have allowed for the exploitation of different environmental zones and mixed farming practised. A body of evidence is also building up, which lends weight to the proposed early origins of hillforts to the Middle Bronze Age, at least in places, for Wales.

Chapter 4: Hillforts and promontory forts: an overview

Introduction

The Atlas of the Hillfort of Britain and Ireland has done much to advance the study of hillforts by providing a detailed definition, and an online database that can be utilised by researchers and members of the public alike. Whilst there may be differences of opinion over what constitutes a hillfort at least the Atlas provides comprehensive coverage and its database is also subject to revision (Hillfort Study Group 2024). The most recent, version 1.1, includes minor edits made prior to publication of the Atlas of Hillforts (*ibid.*). Such an atlas needs to be a living database that incorporates both new sites, and revisions as and when appropriate, such as when a hillfort's status is revised to either confirmed or unconfirmed.

Formerly, hillforts were considered a distinctive feature of the Iron Age, even though constructional evidence for many sites indicates late Bronze Age origins (Mytum 2013, 5 and O'Driscoll *et al.* 2019, 77). However, they are a significant feature of later prehistoric Britain, and this chapter aims to set the scene regarding hillforts within the context of the UK and Ireland and then focus in on southeast Wales. Hillforts are not phenomena restricted to the British Isles and enclosed sites on hills have been observed in Central Europe since the early Bronze Age, c. 1800 BC (Primas 2002, 43 and O'Driscoll *et al.* 2019, 78). Definitions are varied, so for clarity's sake, it should be clear why a given definition is being utilised. As Brown (2009, 2) acknowledges, an encompassing definition has proved somewhat elusive when trying to differentiate between a small enclosure and a hillfort. Furthermore, the distribution of hillforts varies significantly throughout the British Isles; as such, it is necessary to see how the region compares within the context of the UK and Ireland.

Several authors, including Cunliffe (2002, 70), have sought processual explanations for the origins of hillforts. Hamilton and Manley (2001, 7) consider that hillforts may have resulted from "…substantial landscape and social reconfigurations…" and hillforts are therefore said to be indicators of this significant restructuring. This initial phase of hillfort construction has been associated, by some, with a deterioration in climatic conditions resulting in increased pressure on land availability during the later Bronze Age (Campbell 2021, 58). Others see their origins in the debasement of the social value of bronze, where hillforts acted as a substitute for bronze in facilitating social cohesion (Sharples 2010, 112 – 24; and Davis and Sharples 2020, 175).

Cunliffe (2018, 184) opines that the arrival of hillforts at the end of the Bronze Age is a reflection of a growing population that required boundaries, leading ultimately to larger social groupings in the form of villages and hillforts. The reconfiguration of later prehistoric society is manifested in settlement patterns, land use, grain storage in pits, belief systems, metal work and ceramics (Brown 2009, 4; Haselgrove and Pope 2007, 6; and Pope 2003, 393). The hypothesis that hillforts are an indicator of social change is relatively recent and, formerly, continuity was the accepted paradigm for the Bronze Age/Iron Age transition (Brown 2009, 3; Haselgrove and Pope 2007, 4; and Hamilton and Manley 2001, 7). Rather than such apparently opposed positions, a more nuanced approach is required to discern how society was structured and how hillforts functioned within such social structures. It is clear, however, that the creation of these monuments would have taken a combined community effort, given the scale of the undertaking, even for the smallest hillfort (Sharples 2010, 296). As observed by Wallace and Mullen (2019, 1), social identities can be expressed by modifying the landscape, of which hillforts form a part, within the continuum of prehistoric societal expression.

By the later Bronze Age, hillforts had started to appear in the landscape of the British Isles, reaching their maximum extent in the mid-first millennia BC (Driver 2018; O'Driscoll *et al.* 2019, 77; Cunliffe 2013, 304; and Brown 2009, 31 – 2). Cunliffe's (2018, 184) narrative places the earliest hillforts in the Welsh borderlands, dating to the late Bronze Age. From here this cultural expression is said to have spread to the Wessex region in the sixth century BC and by the third century BC hillfort adoption had moved into the southeast of England (*ibid.*).

During the fourth to third centuries BC, there was a move to ever more complex forms being adopted with reference to the architectural features of hillforts, including gateways and boundaries (Driver 2018). Some see this growing architectural complexity, in terms of vallation and entranceways, as a later phenomenon dating as late, at times, as the early Romano-British period. Nevertheless, the narrative remains that they reflect a response to a "…real or perceived threat…", albeit this is a much debated point (Howell 2006, 37 – 9). As discussed previously, this need not be the case and may indicate a move towards differing social practices in the later Iron Age.

As observed by Davis and Sharples (2020, 163), large-scale excavations are very limited and tend to be concentrated in southern England. Therefore, any conclusions drawn from these excavations may not be applicable to other parts of the British Isles, as other regional economies may have had a different form. As such, this would then have been reflected in how the respective hillforts functioned within their host regions. The emphasis on the 'primacy' of hillforts highlights the need to include all such sites to thoroughly analyse the southeast Wales region (Wigley 2007, 176). Given that it is unlikely that significant numbers of new hillforts are likely to be discovered, it makes them suitable as an indicator of later prehistoric society, in this case southeast Wales, albeit limited to a particular level.

Definitions

Davis (2017, 331) observes that when discussing hillforts, the first issue that needs to be addressed relates to the range of definitions available, primarily those that relate to what differentiates a 'hillfort' from an 'enclosure'. Given the definitions formerly utilised and the perceptions of archaeologists when gathering data, it is difficult to view the evidence from an impartial standpoint (Hill 1989, 17). Caution should, therefore, be exercised when using terminology that may infer an unintended meaning upon the reader. In turn, this may perpetuate earlier views of hillforts' functions; therefore, the militaristic nomenclature should be avoided wherever possible. Such an approach adopts current thinking in questioning the perceived militaristic paradigm (Brown 2009, 7; Harding 2012, 1; O'Brien and O'Driscoll 2017, 22; and O'Driscoll, Hawkes and O'Brien 2019, 77). This monument type is particularly challenging to define and probably virtually impossible to achieve consensus upon a single definition (Ralston 2019, 10). At least in part, the problem of a definition relates to the range of materials used in their construction, size and location, and how they were utilised (*ibid*.).

To align this thesis with the 'Atlas of Hillforts of Britain and Ireland'(from now on referred to as the Atlas), the sites had to satisfy at least two of the following criteria: exceed an enclosed area of at least 0.2 ha; have earthworks over 4 m in width when viewed as a cropmark; and to be topographically significant (Ralston 2019, 10 and Brown 2019, 31). It should be noted that the Atlas also includes promontory forts in its figures. Oppida, or sites that might qualify as such, were precluded from the Atlas (Lock and Ralston 2017, and Ralston 2019, 10). The sheer volume of lesser enclosed sites, such as ringforts, raths, duns and rounds, precluded their inclusion in the Atlas and this position is qualified by citing that in Ireland there are in excess of 40,000 raths (Ralston 2019, 10). Many such enclosed sites lie close to the juncture with small hillforts in terms of the area enclosed (Ralston 2019, 10). Such small hillforts occur in west Wales, Cornwall, northern England and southern England. It has also been observed that, in Pembrokeshire, it is often difficult to differentiate between a hillfort and a rath, a small circular enclosure sometimes known as a round (Mytum 1996, 3). The pan-Wales project adopted a more inclusive approach in terms of 'defended enclosures', which included hillforts, coastal promontory forts, ringworks and lowland defended sites.

Hillforts have been subdivided based on the area they enclose, and several avenues have been pursued to this end. The OS (1962) divided hillforts into three categories, dependent upon the area enclosed by the innermost boundaries:

- Up to 1.21 ha
- 1.21 – 6.07 ha
- 6.0 – 8 ha plus

(OS 1962, 13, Harding 2012, 9 and Ralston 2019,16).

These categories, despite revisions, have continued to be used until the present day in one form or another (Ralston 2019, 16). Manley (1989, 114) divides them into two categories: minor forts that enclose less than 1.2 ha and major for those that exceed 1.2 ha. Brown (2009, 2), however, uses 1.4 ha as the threshold. Regarding area, it is not always clear whether authors are referring to a hillfort's internal 'occupiable' area or the total extent of the hillfort (i.e. that enclosed by the maximum extent of the earthworks).

This thesis will refer to both the maximum extent of the earthworks surrounding a hillfort and that of the central area, as demarcated by polygons produced by the author.

Differential preservation has also led to sites being described as a hillfort or ‘small defended farmstead’, despite the latter encompassing a smaller area (Watson and Musson 1993, 33 – 4, and Wigley 2007, 175 – 6). This differential preservation may adversely affect the apparent distribution of hillforts. The examples cited are Walton Camp, Shropshire, a small double-ditched enclosure located in a prominent position that is described as a small multivallate hillfort, whilst the larger ploughed out Walton Camp, a ‘multi-ditched curvilinear enclosure’, merits being described as a ‘small defended settlement’ (*ibid.*). The Atlas aims to address this shortcoming, though and includes sites known only by their cropmark.

Some are critical of many of the terms utilised to describe hillforts, as they are considered to not really assist in our analysis of the Iron Age (Driver 2018). Furthermore, there is a danger that what will result is a mere list or inventory, which will have little value in assisting in our understanding of the Iron Age. Rather than categorising hillforts by specific parameters such as area. Driver (2018) considers that the following exemplar questions are more relevant:

1. Why do these three forts share identical gateways?
2. What bearing did the local topography have on the siting of this hillfort?
3. Why does this gateway face towards a mountain pass?

Whilst this approach has much merit, distribution maps still have an essential role in developing our understanding later prehistory.

O’Driscoll (2017b, 514) observes that should a landscape become denuded of trees, with reference to Ireland, that any works that took place would be in danger of monumentalising a given location, such a premise is equally applicable to southeast Wales. Removing a hillfort from its topographic context effectively divorces it from the intended ‘meaning’ of those who created it and, therefore, consideration should be given to the landscape that prevailed at the time of its construction (Hamilton and Manley 2001, 11). Monumentality, for example at Castell Henllys, may have been a significant feature of many hillforts, as their boundaries often exceed that required for simple martial functionality (Mytum 1996, 9 and 2013, 13 – 4, and Brown 2009, 195). Such boundaries can be seen as a symbol of the overall status of the community or, as some have suggested, that of an elite. This view is further endorsed by the possible ritual burning of elaborate gates at several hillforts, such as at Castel Henllys (Mytum 1996, 9). Llanmelin, Gwent, is an example of a hillfort within the southeast Wales region, which, although it has an elaborate gateway was not burnt, so the two are not necessarily synonymous.

Distribution of hillforts in the UK and Ireland (see Figure 10)

Manley (1989, 114) observed more than 2000 hillforts in Britain and Raftery (1994, 38), between 60 and 80 in Ireland. This figure has been revised significantly by the Atlas, which has 4,147 entries for both Britain and Ireland, of which 3354 have been confirmed ((Ralston 2019, 12) see Figure 10). In Wales, 626 hillforts have been verified out of a potential 690 (Brown 2019, 31). The largest number of hillforts, c. 1694, are located in Scotland (Lock and Ralston 2017), although many of these could be the equivalent of small farmsteads. For Ireland, it has since been reported that there are now over 100 hillforts (O'Driscoll 2017b, 507) and, therefore, seems to be following a similar upward trend to that of England, Scotland and Wales.

From 500 BC onwards, Cunliffe (2002, 74 and 2013, 304) identifies several settlement patterns in Britain, one of which is a hillfort dominated zone that stretches from the south coast of England and up through the Marches to north Wales and the Mersey Estuary. This zone extends eastwards to encompass Warwickshire and Worcestershire, with many hillforts also found in Somerset and Gloucestershire (Brown 2019, 30). Further clusters are to be found north of the Solway Firth in Scotland, and a cluster stretches from Northumberland to the Firth of Tay. Whilst Cunliffe's (2013, 304) model of settlement zones in Britain is broadly concurrent with Brown's (2019, 30), it is observed that the Atlas includes more sites in the north and east. The Atlas indicates a concentration in the Marches and west Wales, as opposed to the south coast of England. Significant hillforts, however, occur in a band stretching from Dorset and Sussex through the Marches to the Mersey estuary, with other foci in the Cotswolds and Northumberland. Brown (2019, 30), more specifically concerning the south of England, observes that hillforts extend "…from Cornwall…, into Devon, Dorset, Hampshire including the Isle of Wight and Wiltshire, north to Oxfordshire and east to Sussex."

Figure 10: Hillforts of the UK and Ireland

© QGIS 2022. Licensed Data: Crown copyright and database right 2018. Ordnance Survey (Digimap Licence). Derived from information held by GGA HER Charitable Trust Database. Derived from: Lock, G. and Ralston, I. 2017. Atlas of Hillforts of Britain and Ireland [ONLINE] Available at: https://hillforts.arch.ox.ac.uk

In terms of hillfort distribution, Maddison (2019, 137) observes that the non-uniform distribution of the data in the Atlas reflects regional characteristics. Furthermore, hillforts are not present uniformly throughout the British Isles and do not form a feature of all landscapes, indicating that they were not an essential facet of later prehistoric life (Brown 2019, 30 and Ralston 2019, 11). Therefore, whatever role they had to play was not absolutely necessary for all communities in later prehistory. As such, this would then lead one to question the primacy status of hillforts in the Iron Age; as clearly, this was not universal due to their absence in some areas.

The following provides a breakdown of hillfort distribution throughout Britain and Ireland:

(a) England

As shown in Figure 10, hillforts are absent from large parts of the north of England and the East Midlands (Brown 2019, 30), although there is a concentration along the Anglo-Scottish border (Ralston 2019, 11). Hillforts are also present in Northamptonshire and Leicestershire, but generally they are sparsely represented in these counties (Brown 2019, 30). A broad corridor, in which hillforts tend not to appear, runs northwards from Sleaford to Lincoln, and then onto Gainsborough and York, with these urban centres acting as a spine for the corridor. Some hillforts are also located along the edge of the Fens, although they are largely absent from Lincolnshire. In Norfolk, there is an isolated cluster centred upon Wells-next-the-Sea. Hillfort numbers are also low south of the Thames in Surrey, eastern Kent and east Sussex, and the North Pennines. There is a noticeable paucity in the Pennines, which is puzzling in that one of the earlier hillforts, Mam Tor, a site that dates to the Late Bronze Age and is some 6 ha in extent, was constructed here. Eastern England also appears to have relatively few hillforts when compared with the rest of England and Wales (Brown 2009, 3), and is broadly concurrent with Cunliffe's (2002, 74 and 2013, 304) zone of villages and open settlements.

Areas of low levels of hillforts in England can be found in the following areas:

- Cornwall Area of Outstanding Natural Beauty (AONB).
- Dartmoor National Park (NP) has a small number on the periphery.

- Sparse in East Anglia.
- Forest of Bowland AONB.
- Kent Downs AONB.
- Lincolnshire Wolds AONB and the Fens.
- North Pennines AONB.
- North York Moors National Park (NP), although there are few on the park’s periphery.
- Northern part of the Peak District NP (north of Mam Tor)
- The Broads.
- Yorkshire Dales NP.

(b) Island of Ireland

O’Brien and O’Driscoll’s (2017, 23; and O’Driscoll, Hawkes and O’Brien 2019, 79) distribution map of prehistoric hillforts in Ireland does not include promontory forts unlike the Atlas, which makes direct comparisons difficult. However, it has been observed that hillforts occur widely in Ireland, although they are absent in some agriculturally productive and ‘extensive lowland’ areas (O’Driscoll, Hawkes and O’Brien 2019, 79).

Regarding Ireland, hillforts are predominantly located in coastal positions with a dispersed pattern in the interior. To the south of Lough Ree and Athlone and north of Birr are areas of blanket bog where hillforts are absent. Again, to the southwest of Limerick, Munster and Cork, including Killarney National Park but excluding the coast, is an area virtually devoid of hillforts. In Northern Ireland, the Sperrins and Binevenagh AONBs and the intervening area, centred upon Dungiven, present a similar absence of hillforts.

Other areas where hillforts are generally absent on the island of Ireland include:

- Area centred upon Ballycroy NP (excluding the coast).
- Burren NP.
- Connemara NP.
- Glenveagh NP.
- Mourne & Slieve Croob AONB.

- Strangford & Lecale AONB.
- Wicklow Mountains NP.

Irish hillforts, particularly the multivallate ones, appear to be concentrated in the south of the island of Ireland (O'Brien and O'Driscoll 2017, 23). Cooney (2000, 22) observes that the trivallate hillforts that form part of the Navan complex and at Mooghaun, Co. Clare, date to between 1200 – 1000 BC and are therefore a feature of the Irish Bronze Age. Approximately 55% of the hillforts of the island of Ireland are univallate, 40% widely spaced multivallate and 5% inland promontory (O'Driscoll *et al.* 2019, 79).

What is particularly prominent in the distribution is the concentration of promontory forts along the south and west coasts of Ireland. This concentration of promontory forts has been linked to the proximity of rich fishing grounds off the coast of Ireland, and may be analogous to what is happening on the Gower and the coast of the Vale of Glamorgan (Maddison Pers. Comms. 2024). Their concentration and siting in such a liminal location would indicate that there was a strong attractor drawing people to these often inhospitable locations, given the presence of the prevailing southwesterly winds.

(c) Scotland

Cunliffe's (2013, 304) model has the hillfort zone to the north of the Solway and from the Tweed up to the Tay. In contrast, the Atlas has hillforts in this area up to Loch Ness and all along the coastal margins of Scotland. This apparent difference in distributions may be explained by contrary interpretations of what constitutes a hillfort, as opposed to 'strongly defended homesteads'. The coastal margins of the Western Highlands are also shown as falling into this strongly defended homestead zone by Cunliffe (2013, 304). However, as can be seen, hillforts are predominant in this area at least according to the Atlas (see Figure 10). Halliday (2019, 71) also observes this increase on the west coast of Scotland, which is again considered to be due to the redefining of the difference between duns and hillforts. Unconfirmed hillforts (*ibid.*), when one moves to the north and west in Scotland, have a significant impact on the distribution, but elsewhere are considered to have only a minimal impact because of the already high densities in the south.

Scotland has a concentration of hillforts along the coastal margins of the Solway Firth, which is at odds with their virtual absence on the English side, which has just one hillfort, Swarthy Hill, Cumbria. This cluster broadens around Dumfries and Lockerbie, Dumfries & Galloway, ceasing at the western edge of the Eskdalemuir Forest. To the north of the Eskdalemuir Forest is a further concentration centred approximately upon Biggar, South Lanarkshire and Peebles, Scottish Borders. In the southeast of Scotland lies a further cluster, centred upon the eastern Scottish Borders, extending down into Northumberland and up to the Lothians, including Edinburgh.

Hillforts are mainly absent from:

- An area centred upon the Cairngorms NP.
- Galloway Forest Park.
- Loch Lomond and the Trossachs NP, although a small number are to the south in Stirlingshire.
- Western Highlands, except for the coast.

As previously observed in the context of Ireland, the siting of hillforts on the coastal margins could indicate a maritime influence or the presence of more suitable environs for locating the hillfort or both. For Orkney, Shetland and the Western Isles, hillforts are generally located on the coast, although on Uist and Skye, a small number are further inland. For example, on North Uist, many are on islands set back from the coast, such as Loch Fada and Loch Caravat, Eilean Dubh Dun Scor. On Skye, there are also a number set back from the coast; for example, Dun Borve, Dun A'Cheitechin, Dun Suladale and Loch An Iasgaich.

(d) Wales

Outside the central Wales upland area, hillforts can be found in clusters: south into Brecon; Caernarfonshire; Cardigan Bay, Cardiganshire and Pembrokeshire; Clwydian Range, northeast Wales; Merioneth; Montgomeryshire; Radnorshire; and along the south Wales coastline and its hinterland (Brown 2019, 30).

Hillforts are mostly absent in Wales from the following areas:

- Black Mountains (Y Mynydd Du), east and west, although some are present on the outer margins.

- Brechfa Forest.
- 'Central Cambrian mountain core' or mid-Wales uplands, also known as Elenydd (*ibid.*).
- Sennybridge Training Area (MOD).
- Parc Cenedlaethol Eryri (Snowdonia NP).
- South Wales Coalfield.
- Tywi Forest.

The absence of hillforts in these areas is brought into sharp focus by the presence of hillforts on their periphery. This area is of marginal agricultural value and there is preponderance for hillforts to be located in more fertile areas at lower altitudes.

Common attributes start to appear when one examines the distribution map produced from the Atlas' data. First and foremost, most (89%) of the hillforts in England and Wales are located below 300 m in altitude (*ibid.* 33). The presence of national parks and AONBs, the majority of which are in upland areas, where hillforts are unsurprisingly absent highlights the matter. For example, in the Cairngorms NP, many peaks exceed 1000 m, and both hillforts and roundhouses are absent. In Cornwall, Ireland, Scotland and Wales, a significant proportion are on or near the coast, perhaps indicating the importance of a maritime location, whether for trade or fishing. The oft-quoted pairs at the mouth of valleys and along valleys also indicate the importance of these geographical locations, which may have facilitated access to neighbouring communities or passage to summer grazing in the uplands.

Potential roles or functions

Before entering into a discourse on the roles of hillforts, it is worth reiterating Hill's (1995, 45) critique:

> **What if?**
> What if there were not chiefdoms in the Iron Age?
> What if the defences surrounding hillforts were not defensive?
> What if the common assumption of a generalised 'Celtic' form of Iron Age social organisation or religion is a myth?
> What if hillforts and oppida can not be understood within the framework of Central Place Theory?

> What if the very archaeological record we excavate is not a straightforward reflection of the past?
> What if the European Iron Age was fundamentally different from what we have always assumed?
> What if…?

These questions set the scene for a critical approach to perceived self-evident facts as to the roles and functions of hillforts.

As to the role that hillforts may have had in later prehistory, question three of this thesis, there are various stances on their function(s), ranging from defensive to monumentality to one of dominance, including trade routes and resources (Condit and O'Sullivan 1999, 25; Brown 2009, 190 – 204; and O'Driscoll 2017b, 507). One should consider these before coming to conclusions based on the evidential base produced by utilising GIS, as such evidence may affirm a given stance or refute it. Oatley and Howell (2013, 13), as an indication of the complexity vis-à-vis the nature of hillforts, observe that their role probably varied by time, occupant, hillfort, trade, religious persuasion of occupants; residency, and 'other functions'. Generalisations should therefore not be made about a hillfort's role based solely on its morphology or size (Davies (1995, 676). An alternative approach by Condit and O'Sullivan (1999, 25) involves viewing hillforts as one moves through the wider landscape instead of just as a series of static points within a region. Whilst this stance has some merit, hillforts would have acted as node of some sort for those responsible for their construction.

Harding (2012, 9) observes that hillforts that fall into the smallest category would not have functioned like that of the largest, which appears self-evident. Given the range in size of hillforts, it is best to view them as occupying a position on a spectrum rather than fulfilling the same function throughout the range. Frodsham *et al.* (2007, 250) utilise the comparison of Buckingham Palace with a terraced house in a northeast mining village as representative of what constitutes a dwelling to highlight the breadth in range of this spectrum. It has been acknowledged that such enclosures "…served a multiplicity of functions, and their social, political and economic role is far from being fully understood." (Wiggins 2006, 3). It is questionable whether the functions need to be mutually exclusive or that there was a need for hillforts; as observed earlier, given they are absent from some areas (Mytum 1996, 9 and Karl 2008, 75).

Discourse has formerly centred on defence, despite the poor defensibility of some sites and monumentality, with their respective adherents, but these may not be mutually exclusive, and their function may have changed over time (Brown 2009, 190 – 223; Harding 2012, 27 – 8; O'Driscoll 2017b, 507; Driver 2018; and O'Driscoll *et al.* 2019, 77). Raftery (1994, 57) questions, with reference to Ireland, whether hillforts may have also served as commercial or ceremonial centres, as opposed to being of a purely defensive nature and indicates a move from the purely martial position. The martial premise, nevertheless, still features in the narrative of hillforts, at least to some extent, as some are still espousing the paradigm. Indeed, Timmins (2011, 2) questions the merits of separating hillforts from defended enclosures and 'applying modern terms' to such sites. Furthermore, there has been a move from what can be best described as the functional approaches to those relating to public space and communality (Murray 2019, 117; Harding 2012, 27 – 8; and Sharples 2010, 171).

In the 8th century BC, the Breiddin was abandoned and at this time, Llwyn Bryn-Dinas also. Davies (1995, 675) suggests that abandonment, apparently common to many sites, indicates transient or spasmodic stresses, which may have impacted how society was structured in these areas. Some have also seen periodic marginality lead to the adoption of redistributive strategies and, as a result, increasingly more hierarchical social structures (Coles and Mills 1998, xi). In principle, social changes may leave subsistence techniques unaltered, as they could provide a coping mechanism to deal with short-term harvest downturns. Amelioration in the climate at about 400 BC allowed population recovery in the Marches and the Breiddin reoccupied from the late 3rd to 1st centuries BC. Environmental inertia and other aspects, such as the local economy, may all have had a role to play. In areas of a more marginal nature, recovery would take longer, or it simply may not have occurred.

The following endeavour to explain these various positions, but it should be borne in mind that there may inevitably be a degree of overlap between the categories.

(a) Defence

The term hillfort conjures preconceived images of the monument as a place of refuge during a time of war. Defences may have proved necessary at times, as Sharples (2010, 296) opines, "… I have no doubt that warfare was endemic in these societies". Society was probably more violent than today's, but it need not have been in a state of perpetual warfare, as social order would have broken down. However, relatively low-level violence was clearly endemic.

Models such as these tend to neglect that hillforts might also indicate the social change that occurred within society at the time (Moore 2007a, 259). It should be noted that there has been a marked shift away from such theories within archaeological circles, as can be seen in recent work about Cornish hillforts (Historic Cornwall 2024). The lack of provision for a water supply within the 'defences' of many hillforts indicate that they would be unable to withstand a sustained siege, although this does not rule out skirmishes (Lock and Ralston 2022, 298). Hamilton and Manley (2001, 34) refer to 'cliched descriptions' about the purported defensive aspects and capabilities of hillfort locations. Wherever possible, it was determined that less loaded terms would be used within this thesis; for example, boundary instead of defence.

The focus on monumentality also mirrors the move from a perceived martial function emphasising control over the surrounding area to one of status, accentuated by a hillfort's siting. Bowden and McOmish (1989, 13), with reference to Scratchbury, suggested that hillforts with highly visible interiors, overlooked from surrounding higher ground, were untenable as military strongholds, and perhaps had alternative ceremonial roles. To maximise this impression, as widely as possible, ostentatious or elaborate boundaries were constructed (Brown, 2009; Sharples, 2010, 123; and O'Driscoll 2017a, 93 and 2017b, 514).

(b) Centres of control

Jones' (1960, 77) assertion that:

> Dinorben provides a clear answer to that question which for so long has puzzled archaeologists; what kind of social organisation in the Early Iron Age made possible the construction of such large structures as this hill-fort, which

> embraced within multiple ramparts an area of no less than five acres? An undertaking such as this would have required control over the resources of an area far larger than the lands of one hamlet. The rents and labour services levied by the lord of Dinorben on the tenants of the appendant hamlets of his maenor provide testimony as to how the requisite control over the resources of a wide area was effected.

This view is a somewhat centralistic or 'top-down' approach in its outlook, though the complexities of organising such an undertaking should not be dismissed lightly. These views about centralised power structures were being espoused until the mid-2000s by Cunliffe (2002, 299), who observes that "The absence of large hillforts strongly suggests a lack of centralized government." regarding south and west Wales or, more cautiously, in the case of Aston (2002, 44) "…fulfilled this role to some extent." However, Sharples (2010, 241 – 2) observes, regarding the Yorkshire Wolds, that hillforts appear before the emergence of elite burials, although this need not negate the significance or role of such an elite.

Cunliffe (2002, 299) expresses the view that the larger hillforts, within a region, would tend to be the seat of governance by tribal elites, whilst those, by default, of a lower social hierarchical status occupied smaller enclosed sites and, presumably, open sites. Hill (1995, 45) is, however, critical of this and contends that the evidence does not support such suppositions as hillforts were "...centres of production, exchange or as elite residences." This construct of a hierarchical society appears to have its basis in the observers' preconceived expressions of status, as expressed by an elite, rather than potentially being a communal expression by a given society. It would also appear to reflect modern societal structures that are probably inappropriate in this context. To this end, the excavations at Caerau, Ely have not provided any evidence for this degree of social stratification to support such an assertion (Davis 2017, 350). If Cunliffe's view were correct for southeast Wales, one would have expected it to be evident from the excavations at Caerau, Ely particularly given the scale and prominence of this hillfort in the surrounding landscape. The view of tribal elites occupying such sites, albeit regarding Ireland, is still being espoused by some authors, such as O'Driscoll (2017a, 73 and 87), but the experience of Ireland in later prehistory may not reflect that of southeast Wales.

Studies of contemporary large hillfort sites indicate they may have had spheres of influence of similar sizes, as they are approximately equidistant apart in southern England (Audouze and Büchsenschütz 1992, 179). The location of hillforts on or near the mouths of valleys or other important geographical features, such as at Wilcrick Hill, may indicate their influence on the landscape. Furthermore, hillforts have been considered to relate to either a statement of status, a means of controlling a broader hinterland or a combination of the two (Brown 2009, 195 – 6). Cooney (2000, 27) observes a similar relationship with hillforts in strategic locations along the Slaney Valley from Wicklow to Clare in Ireland. Karl (2008, 75 – 6) notes the necessity of having such sites for communal activities within any given locale but also observes by the later Iron Age that the emergence of 'estates' would generate a need for central places. This terminology is loaded and hints at the presence of a hierarchical society, which may not have existed.

(c) Symbolic architecture of the community

Research on Cornish hillforts indicates authority was not vested in an elite but held by representatives of the community who, in turn, controlled their respective areas (Historic Cornwall 2024). Hillforts are then in turn seen as meeting places for local farmers with antecedents, in the form of hill-top enclosures, dating from the Neolithic and Early Bronze Age (*ibid.*). On Dartmoor, hillforts were constructed along the periphery of the moor, thus occupying a liminal position, and also potentially changing the community focus from that of the monumental/ritual landscape of the high moor (Quinnell 1996, 80 and Harkel *et al.* 2012, 183). In a very functionalist way, hillforts could be located in their respective positions to increase their ability to exploit adjoining environmental niches (Darvill 2002, 59 and Davies 1995, 676 – 7).

A large labour force would have been required to construct even the smallest hillfort. The construction of a hillfort would inevitably facilitate social cohesion within neighbouring communities by virtue of people coming together with a common goal, and potentially by providing a community hub to resolve social and political matters (Davis and Sharples 2020, 176). Coming together to facilitate construction may not have occurred passively but could have involved a degree of coercion (Sharples 2010, 296). The fact that communities came together though, possibly annually, to work on a hillfort's boundaries is a significant achievement that should not be underestimated (Sharples 2010, 296). This act would have engendered a sense of place for the local community, which urban planners strive to achieve even today.

A more experiential approach, adopted by Hamilton and Manley (2001, 10), attempted to reflect the varying perspectives that one may have viewed a hillfort. A number of researchers have developed upon this discourse by analysing certain embellishments or aggrandisement of the structural features of hillforts, such as vallation and entrances (Murray 2019, 117 and Driver 2018). With reference to boundaries, the term 'disproportionate vallation' has been coined, whereupon a particularly prominent area gives the hillfort 'morphological directionality' (Murray 2019, 117 and 119). This approach appears vindicated in that 71% of the hillforts reviewed had unnecessary or excessive vallation from a purely strategic perspective (*ibid.*). Concerning the Gower, it was observed that those areas of a hillfort that were most visible from beyond the hillfort often had the most elaborate earthworks, whether they were necessary or not in this location (*ibid.* 121 – 2). One particular example cited included Bulwark, Llanmadoc Hill with a broad area between the vallation, effectively creating an inner and outer enclosure duality. To the southeast lies Hardings Down, and the three hillforts here have views of the Bulwark's interior on its southern aspect (*ibid.* 122).

(d) Economic

Some researchers have suggested various economic models for how hillforts are thought to have functioned in later prehistory. For example, Dinorben, Clwyd is thought to have fulfilled the role of having an economically inclined function, as it is considered to have had a degree of control over the trade route for gold from Ireland (Osgood 1999, 9).

The Breiddin, a hillfort of Late Bronze Age origins in the Welsh Marches, encloses an area of c. 28 ha and is an exception in that most hillforts enclose areas of between 3 and 5 ha (Davies 1995, 674). Its size may indicate its economic importance in later prehistory (*ibid.*). Evidence of habitation and bronze working within the palisaded hilltop occurred from c. 900 BC onwards (Manley 1989, 118); the site, therefore, appears to have been a focal point for the local economy. There are several four-posters, considered to be grain storage buildings, which implies the production of surpluses and a concentration of storage and distribution, at least locally. Some consider that community status would be based on the control of land, agricultural productivity, and storage centralisation (Davis and Sharples 2020, 176).

At Castell Henllys, Pembrokeshire, there was no evidence of grain preparation, such as a threshing floor. Therefore, the presence of four-posters and a corn drying oven have been considered by some to be indicative of a tribute payment from the hillfort's hinterland (Mytum 2013, 18). Equally, it could be the equivalent of the wider community's storage depot. Indeed, some sites appear to have had a storage capacity far above the populations' requirements for food and considerably larger than those of neighbouring sites, for example at Danebury, Hampshire. One should consider whether such pits or four posters were contemporaneous with one another when making such an assertion though. Additionally, the presence of pits and four posters may not be a universal trait. As observed by Hill (1995, 48), they do not feature at all Wessex hillforts and this could also be true for southeast Wales. The Breiddin's finds included items of personal adornment, weapons and tools that have been said to be indicative of a site of relatively high status, but this may not be indicative of what was actually happening at other hillforts. Ultimately, one has to consider that hillforts are not universal and yet redistributive practises may still have occurred (*ibid.*).

(e) Settlement

In southeast Wales, most hillforts have yet to be excavated, and as such, no definitive conclusion can be made, but what work that has been done, such as that at Caerau Hillfort, is already showing signs of occupation. Further excavations at hillfort sites may also confirm the presence of dwellings, such as those that might be present at Llanmelin Hillfort. These settlements may then have constituted towns or villages dependent on their size. However, to address this unknown element the interiors of hillforts in the region require excavation (Davis and Sharples 2020, 268).

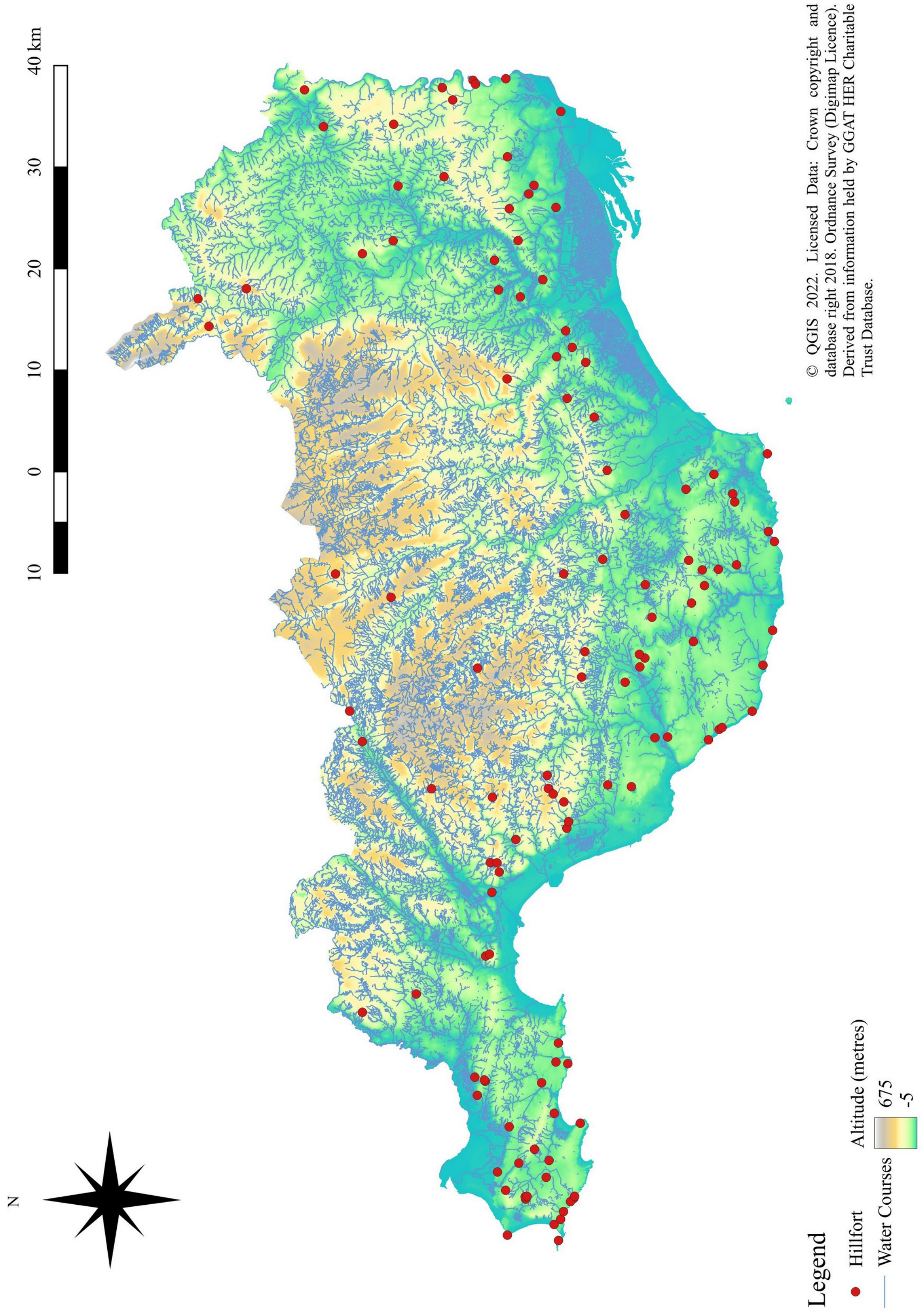
Davis and Sharples (2020, 168) consider that this paucity is down to mediaeval and later farming practises, although nine hillforts in Glamorgan have roundhouse platforms present. Lock and Ralston (2022, 247 and 311), observe that two thirds of hillforts that have been excavated within the confines of the innermost boundary show no clear evidence for roundhouses and is, furthermore, notable by its absence. A residential function is entirely plausible for at least some hillforts, but other uses may also have been present. Regarding Caerau, Ely it has been observed that some houses, encompassed by penannular ring ditches, were constructed during the early phase of occupation and are considered to "…represent the centralisation of households…" from within the catchment of the hillfort (*ibid.* 176) and, as previously observed, facilitate social cohesion.

Hillforts and promontory forts in southeast Wales (see Figure 11)
Comparisons with west Wales have frequently been drawn by researchers when analysing the data from Glamorgan regarding settlement type and patterns (Cunliffe 2002, 292 – 3 and Davis 2017, 329). This approach may be a relatively narrow and self-limiting interpretation of the available data, as there are larger hillforts within the region than in southwest Wales, certainly for eastern Glamorgan and Gwent. Cunliffe (2002, 292) states, "The southern coastal area of Wales, stretching from the Usk valley to Pembrokeshire, was in many ways similar in its settlement pattern to the south-west peninsula of England…" This stance seems to ignore the presence of some large hillforts within southeast Wales, for example, Lodge Wood and Caerau Camp, Ely, at approximately 6.15 and 9.01 ha respectively.

Furthermore, Cunliffe (2013, 304), somewhat incongruously in light of the above assertion, includes a substantial part of the southeast Wales region within the 'Hillfort dominated zone'. This zone stretches approximately from Llantwit Major to the Wye for southeast Wales. This assertion seems to ignore the presence of some substantial hillforts, over 6 ha, further west than Llantwit Major, such as Y Bwlwarcau, Bridgend (GGAT 00116m) at 31.7 ha. However, Davis and Sharples (2020, 177) also observe that,

> …the larger, more material-rich hillforts, like Caerau, cluster in the east of Glamorgan, while the smaller sites are more densely distributed in the west of the region. The larger hillforts apparently have more in common with the hillforts of central and southern England and the smaller hillforts are more similar to those found in Dyfed.

Figure 11: Southeast Wales: hillforts



Glamorgan is viewed as the boundary or 'frontier zone' juxtaposing two differing socioeconomic systems, reflected in the general reduction in hillfort size as one moves westward.

It has been suggested that there is a corollary between hillfort size and community size in that larger hillforts are indicative of large communities; therefore, if this is followed through, smaller hillforts should be associated with small communities (Davies and Lynch 2000, 161 and Davis and Sharples 2020, 166). The size and number of hillforts in southeast Wales are taken to be indicative of the land's higher carrying capacity when compared with southwest Wales (Davies and Lynch 2000, 161; Murray 2016, 8; and Davis and Sharples 2020, 166). At least in some areas, the region's settlement structure may have had a predilection for dispersed, smaller enclosed or open settlement forms.

In Wales and the Marches, 50% of hillforts' boundaries have been dated from the Late Bronze Age (Campbell 2021, 182), although Davies and Lynch (2000, 150 – 1) view the emergence of hillforts as occurring during the Late Bronze Age/Early Iron Age in the Marches, particularly for those in the northern and central Marches. The lack of a compelling chronology leaves this open to debate as an assertion (Davis and Sharples 2013, 11). It would, however, appear at odds with the presence of hillforts with Late Bronze Age occupation at sites such as Caerau, Cardiff and Llanmelin, Gwent. This earlier use would support Cunliffe's (2018, 184) assertion that the earliest hillforts occur in the Welsh borderland and extend into southeast Wales. Ceramic evidence indicates that the majority of smaller hillforts date to the Late Iron Age, but the limited number excavated and their small scale, many of which were poorly funded developer-led excavations, may mean that this stance is subsequently revised (Davis and Sharples 2020, 175 and Davis 2017, 331). Subsequent evidence may indicate that many hillforts in southeast Wales have their origins in the later Bronze Age. Due to the paucity of excavation and dates for the region, it was impossible to determine whether there was a continuity of settlement occupation by location throughout later prehistory. Nevertheless, some sites appear to have multi-period occupancy.

Site types were taken directly from the HER's 'Type' classification from within the dataset provided by Glamorgan Gwent Archaeological Trust and the Atlas. However, regarding their nature, it was determined not to view them from a martial perspective, as this may be inappropriate for the reasons already highlighted. The type/broad classes, taken from the HER, included 98 hillforts and 17 promontory forts. Hillforts and promontory forts, generally speaking, occupy a broad swathe of land between the region's uplands and the coast (see Figure 11). Due to the sheer physical presence and monumentality of such sites, it is unlikely that many new ones will be identified within the region, although smaller enclosed sites are another matter and will, in all probability, continue to be identified. Such additional sites will then go on to assist in explaining perceived gaps and broaden our knowledge of existing patterns (Mytum 2018).

Size, vallation and entrance design are a number of the features of a hillfort's structure that have been utilised as indicants of the level of societal status attained by the occupants within what is being purported as a hierarchically structured society (Cunliffe 2002, 299; Davies and Lynch 2000, 218; and Lancaster 2014, 27 – 30). These form differences could also indicate that hillforts may not have served a uniform purpose throughout southeast Wales. For example, Davis (2017, 337) has observed two notable differences between coastal promontory forts: those that enclose an actual promontory and where the cliff edge is used as part of the means of enclosure. Davis (2017, 337) further considers that "…the coast was of primary importance, providing liminal spaces between land and sea…" Whilst this may be true, in that the location afforded what was required by those who utilised the site, it may be giving too much emphasis on the importance of liminality for all such sites.

Some enclosures did not feature in the data supplied by GGA because they were defined as Iron Age defended enclosures, as opposed to hillforts, or their provenance was uncertain (Wiggins 2006, 9); for example, Pen Toppen Ash Camp/Coed Y Caerau (GGAT 00415g), Langstone. The Atlas (2020) has, however, included sites, at least on occasion, with the caveat 'Unconfirmed: Questions remain re data' although confusingly, the status is marked as confirmed on the summary provided for Pen Toppen Ash Camp/Coed Y Caerau. However, Evans (2002, 1) considers the site more representative of a later prehistoric/Romano-British settlement than a hillfort. Furthermore, Pen Toppen Ash is set down from the brow of the hill, on the southeastern flank, Given the degree of uncertainty about such sites, a decision was made not to include them in the analyses of the available data concerning hillforts within this thesis, but to treat them as enclosed settlements where appropriate. Britnell and Silvester (2018) also observe, presumably for the above reasons, that smaller hillforts of less than 1.2 ha are also often only selectively included on distribution maps. This thesis identifies such sites on a distribution map for southeast Wales (see Figure 11) for completeness.

Conclusion

Given the widespread nature and number of hillforts, they are essential to our understanding of later prehistoric life, at least for those areas in which they are present. As can be seen, hillforts have multi-faceted dimensions regarding the roles they may have served in later prehistoric society. A few narratives are evolving that may assist in our understanding of these functions/roles, such as monumentality and morphological directionality. Additionally, how aspects, such as form, size and location, may reflect upon the differing socioeconomic systems that led ultimately to their construction.

The embellishments and aggrandisement of hillforts, referred to by Murray, clearly go beyond the purely functional explanations formerly cited, requiring more satisfactory narratives to be developed. Furthermore, the absence of hillforts from parts of the British Isles, such as parts of the east of England, indicates that they were not an essential feature of Iron Age society, at least for these areas. In any event, there will be an aversion to applying clichéd descriptions to hillforts wherever possible within the following analysis.

In terms of locational factors, what is evident is an aversion to siting hillforts above 300 m in altitude, as the majority of the hillforts in England and Wales fall below this threshold (Brown 2019, 33). With Scottish hillforts, such areas have been similarly avoided. By way of an explanation, one would generally live in a more hospitable area by selecting sites at lower altitudes adjacent to a more productive environment, either from a farming or fishing perspective. However, as two thirds of excavated hillforts, within the confines of the innermost boundary, present no clear evidence for the presence of roundhouses, there should be no presumption that such sites comprise a settlement unless there is evidence to the contrary (Lock and Ralston 2022, 247 and 311).

Chapter 5: Settlement and agriculture, in the context of hillforts: an overview

Introduction

Understanding the settlement distributions of later prehistoric society in southeast Wales, and the interrelationship with their agricultural base and hillforts is vital to understanding how society operated and the landscape utilised. This chapter aims to set out the broader context of settlement in Britain and then focuses on Wales. Due to the differences in approach between the island of Ireland and Britain in terms of recording nomenclature, Ireland was excluded from this analysis. When developing this narrative, it was necessary to ultimately place it within the context of hillforts. By the Late Bronze Age, a broader range of settlement forms were utilised, such as the hillfort and crannogs (lake dwellings constructed on artificial islands (Bradley 2007, 223)). However, there are no crannogs in southeast Wales, although one is present in the former county of Brecknockshire at Llangorse lake to the north of the region.

As observed by Sharples (2010, 187), the house was a dominant feature in the prehistoric landscape along with the physical geography of an area, in this case, southern Britain. It took until the Middle Bronze Age for dwellings to start to make more of an impact, presumably coinciding with the increasing reliance upon more sedentary agricultural practices (Davies 1995, 671 and Sharples 2010, 187). This tallies with Audouze and Büchsenschütz's (1992, 153) assertion that "…agriculture assumed the fundamental role that it retained up to the Industrial Revolution" during this period. As such, settlements of any type should not be divorced from what would have been their agricultural base.

Due to the introduction of iron, some think that profound changes in exchange networks impinged upon even settlement location. Current thinking on the matter, as endorsed by some authors, is that such a transition occurred about 800 BC, as evidenced by a marked change in the 'character' of later prehistoric society, which is said to have included an intensification of land use (Haselgrove and Pope 2007, 4 – 5 and Cunliffe 2013, 291). By 650 BC, there was a shift, generally speaking, in funerary practise from cremation burial in urnfields to inhumations as well (Darvill 2002, 118 and 158 respectively), which would appear to support this hypothesis.

It has been asserted that dispersed settlements are the norm for both Britain and Scandinavia, whilst continental Europe appears more nucleated (Audouze and Büchsenschütz 1991, 178). However, when referring to Wessex, Hill (1995, 45) indicates that the nature of settlement here, including hillforts and enclosed settlements, was of a more dispersed nature. Sharples (2010, 62) counters this assertion by observing the absence of hillforts in the central Salisbury Plain or central Dorset Downs. This distribution pattern is said to include small unenclosed villages, the most numerous category, and various types of enclosed settlements. It is worth noting that this assertion appears to have not been tested statistically and is not qualified. Before the late Bronze Age, much of Europe would have comprised very small farming communities that would have only participated in trade to a limited degree but would have gathered together for events, such as markets and festivals.

At the heart of these differing settlement types is the house and how it was occupied, which Sharples (2010, 177) observes would be central to a person's perceptual geography and psychology in later prehistory; to this day, this is still arguably true. It is this role that a dwelling plays in society that makes it vital in understanding the social structure of the time. Dwellings would have required a communal effort in their construction, inevitably bringing people together and enhancing the sense of community and place.

The importance of the roundhouse in the British Isles is in stark contrast with continental Europe, where the use of rectilinear structures was ubiquitous. Roundhouse construction techniques varied, with dry stone walling and turf typical in Wales, Scotland and Cornwall, which is hardly surprising given the available raw materials. The importance of timber must not be underestimated as, in many areas, it would have been the principal source of building materials, source of fuel, provided fence stakes, had religious significance as woodland, and was used in the construction of tools, for example, the ard. Reynolds (1995, 201) estimates that a roundhouse of 9 – 10 m in diameter would have required over 100 trees to construct. Wood was also required for wattle and daub, and planking was utilised for the walls of roundhouses. Until the advent of the ‘Industrial Revolution’, homes had vernacular regional architectural styles, both in terms of the construction techniques and materials used. Evidently, this was also the case in prehistory, with roundhouses reflecting the availability of local building materials.

Not all aspects of a settlement will date from the latter part of the second millennium to the early first millennium BC, but the actual breakdown remains to be determined. However, reliance on form will have to suffice due to the absence of dating for many of these structures. Most settlements appear to have been constructed with little thought to defence, though some are enclosed by palisades or walls (Manley 1989, 101 – 2). As such, Cunliffe’s (2002) reference to strongly defended farmsteads is probably unwarranted and unhelpful, given the use of such loaded language. After all, this may have more to do with, where enclosures were present, containing stock rather than defence or declaring one’s presence.

Definitions

As Hedeager (1992, 182) highlights, concerning the importance of defining what constitutes a settlement, with the following observation,

> In archaeological terms, an ‘Iron-Age settlement’ may be anything from simple pits, hearths and culture layers with potsherds through simple building traces to full villages.

Therefore, the choice over what constitutes a settlement must be reasoned and a consistent approach taken. For the remit of this paper, a settlement shall constitute something more than the ephemeral evidence of a campsite and relate to permanent or at least semi-permanent occupation associated with transhumance. The evidence is also more extensive by the build-up of physical remains due to a protracted period of occupation in a given locality. One of this thesis aims is to determine what geographical factors, if any, are associated with selecting a site for occupation.

Davis (2017, 331) shuns the term ‘defended’, as it carries martial connotations, which may be considered inappropriate or even unsubstantiated in this context; as such, the terms enclosed and settlement, for open sites, will be used accordingly. Using the term ‘defended’ would imply that people lived in a state of fear and that the sole reason for building such structures would be to mitigate against some perceived threat. Such a stance is a relatively shallow perspective on what was happening, as people and goods were being moved around to a greater or lesser extent and would not have taken place should the area have been in a state of near constant lawlessness.

Settlement zones of Britain

Roundhouses were common throughout the British Isles from the Middle Bronze Age. However, there is considerable variation in both the layout and form of the settlements in which they were placed. Cunliffe (2002, 74 and 2013, 304) describes much of Glamorgan as falling into the zone of 'strongly defended homesteads', which again perpetuates a narrative of violence, with the remainder, to the east, falling into the hillfort zone. This narrative would appear to be a rather Anglocentric as the strongly defended homestead zone is dominant on the western seaboard of Britain. Furthermore, the only area that merits inclusion in the villages and open settlement zone is an area encompassed by the modern English regions of the East Midlands and East of England. Using such loaded language gives the impression that this area was in some way more civilised, but without the evidential base to make such a claim. To the north of this zone lies that of the enclosed homesteads, whose northern boundary, broadly speaking, follows a zone centred upon the Anglo-Scottish border.

Rather than explore new narratives that may explain these regional differences, it would appear that reliance is being placed on perceived truths; even the chapter heading used to describe this narrative is entitled Episodes of Conflict, 800 – 60 BC, with the Marcher region described as being as 'inherently unstable' (Cunliffe 2013, 303 – 4). In this author's opinion, this necessitates using more neutral language, as described above (i.e. enclosed and settlement), in developing a new narrative to explain these differences.

Distribution of roundhouses in Britain (see Figure 12)

The concept that most Iron Age people lived in hillforts, with the surrounding countryside simply devoid of any other settlement forms, seems implausible (Davis

2017, 333). One only has to look to the Industrial Revolution and the associated large-scale movements of people from dispersed rural settlements to urban areas, which continued well into the 20th century; evidenced by the significant number of abandoned dwellings in the Welsh countryside. These provide a stark reminder of how rural the population would have been.

In some areas, such as Montgomeryshire, Pembrokeshire and Gwynedd, the density of enclosed and open settlements for the Iron Age is almost on a par with the current levels of farms (Ritchie 2018). In a broader context, Mytum (2018) opines that by the later Iron Age,

> …that many, if not all, regions with agriculturally productive land (whether for arable or pasture) were fully occupied, with a density of settlement reminiscent of early modern times if an element of unenclosed settlement is also assumed.

The following provides a breakdown of the roundhouse distribution throughout Britain, with reference to hillforts:

(a) England

Green and Creswell (2021, 28) observe 'intense settlement' clusters in Bodmin, Dartmoor, Exmoor, Penwith and the Scilly Isles for the Bronze Age with another cluster in the Thames Basin for the Bronze Age. It is also determined that settlement evidence "…is much sparser…" when compared with the Iron Age, where it is considered to be "…more stable and dense…" (Green and Creswell 2021, 28).

From the southern section of the M25 and north of the M4, excluding the Marches, runs a broad swathe of roundhouses, which gradually expands westwards to the coast from Bakewell northwards. The Yorkshire Dales NP, Northumberland NP and Lake District NP also have pronounced concentrations of roundhouses. Furthermore, a concentration to the north and east of the river Ouse continues north of York. Other concentrations include an area north of Farringdon and one centred upon Felixstowe.

Areas of low levels of roundhouses in England can be found in the following areas:

- Forest of Bowland AONB.

Figure 12: Distribution of roundhouses in Britain

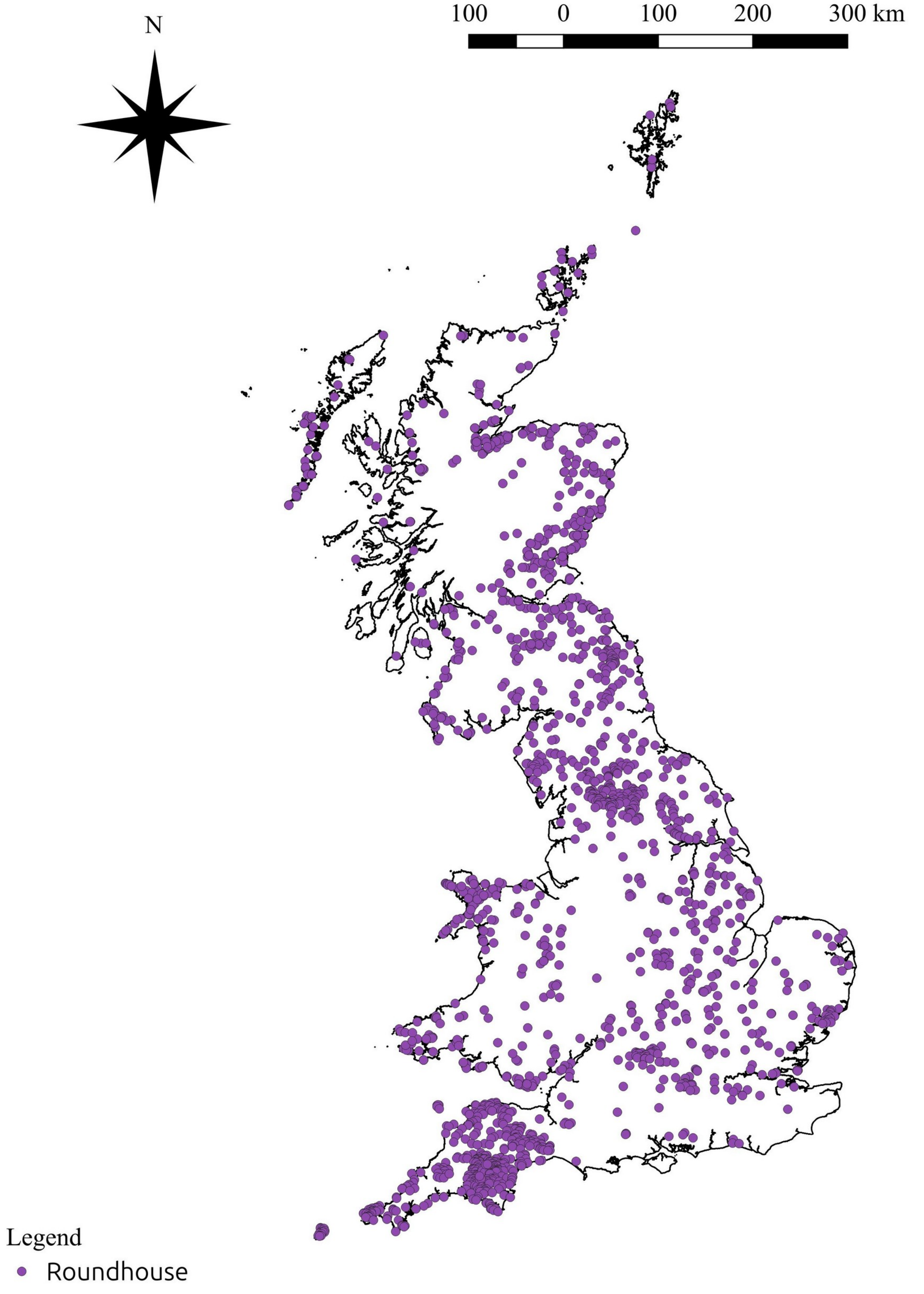
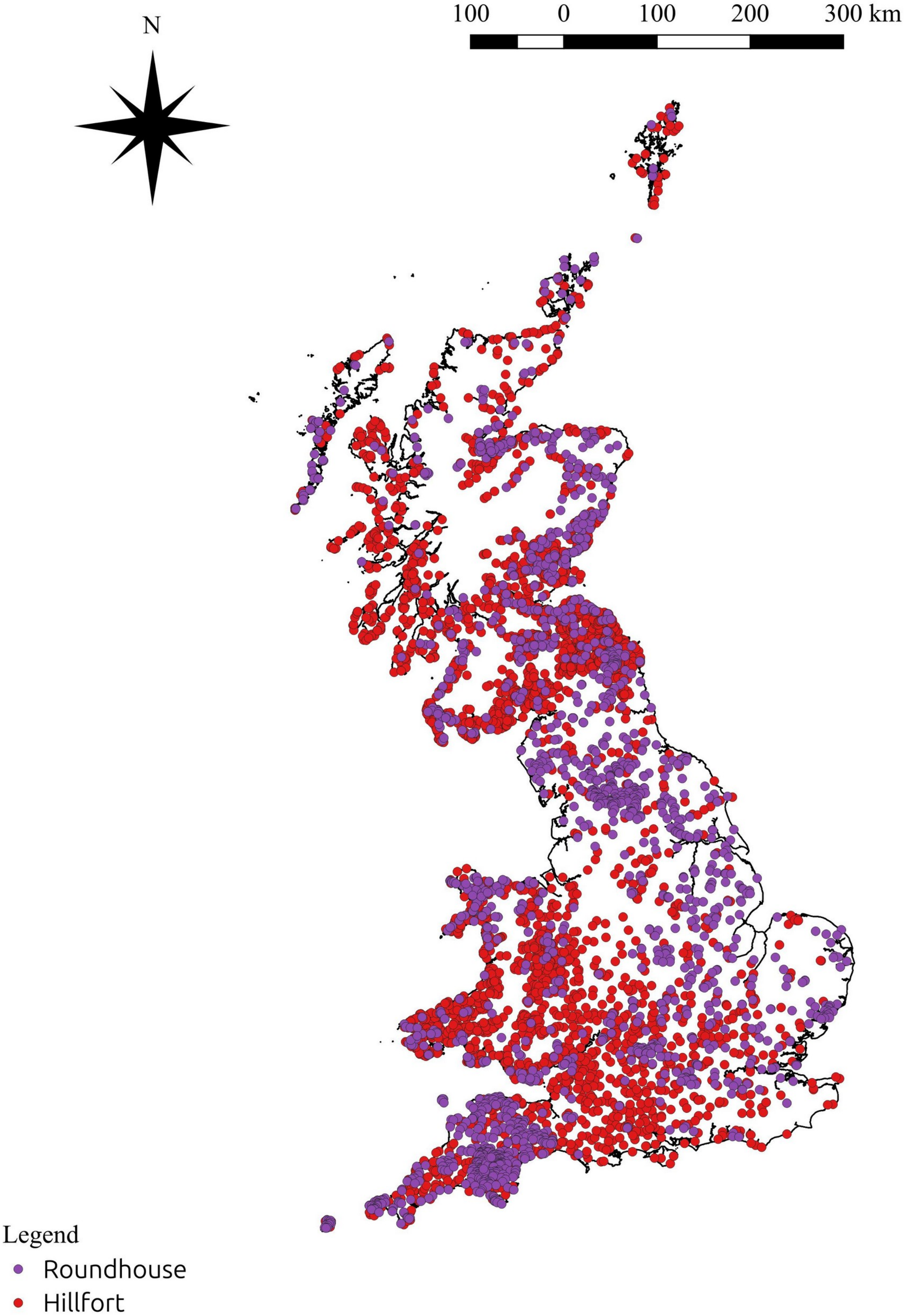


Figure 13: Distribution of roundhouses and hillforts in Britain



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- Kent Downs through the Weald to the Salisbury Plains and then northwards up to the Severn Estuary. Hillforts dominate the central area and correlate with the southern extent of Cunliffe's (2002, 74 and 2013, 304) hillfort dominated zone (see Figure 13).
- Lancashire (Green and Creswell 2021, 28 – 9).
- Norfolk, a strip running north-south through Norfolk.
- North York Moors NP.
- West Midlands (*ibid.* 28).

These low levels probably reflect intensive agricultural practises and conversely, poor agricultural land in prehistory in Norfolk and the North York Moors NP. The limited presence in the West Midlands may reflect the intensive agricultural post-war practices of the area, at least in part.

(b) Scotland

In Scotland, the 'strongly defended settlements' are said to predominate along the western seaboard in Cunliffe's narrative. However, as noted in the chapter 'Hillforts and promontory forts- an overview', this may have more to do with definitions, as the Atlas has far more hillforts than roundhouses in this region. Alternatively, this may reflect the presence of broch and duns as opposed to roundhouses. The overall distribution on the West Coast is similar to hillforts, although at a lower level. This distribution may have much to do with the presence of suitable environmental factors, such as a lower altitude and the presence of an exploitable coastline. On the Outer Hebrides, running from Uist to Mingulay, roundhouses are predominant, reversing the pattern on the mainland and the Inner Hebrides. This reversal may have more to do with definitions, again, than reflecting actual differences. The picture on the Orkney Islands is more balanced, yet there is a an apparent shift to hillforts in the Shetland Isles.

On the East Coast from the Forth to the area around the Moray Firth, the picture, in terms of numbers and distribution, is far more balanced between hillforts and roundhouses. Stretching up from the Anglo-Scottish border to the Forth hillforts predominate, but again, the distribution of roundhouses is similar, but at much lower densities. It should be noted that this pattern stretches south of the border into England.

Along the Atlantic margins of Scotland, brochs (roundhouses constructed of stone) are prevalent and like hillforts required a significant community investment in their construction (Sharples and Parker Pearson 1997, 265; ans Sharples 2010, 312). Sharples (2010, 312) observes that these isolated communities lived in an agriculturally marginal area. However, their focus was probably the sea and shore rather than the land, although evidence for an infield system exists. Despite reservations of using the term 'extended families' for roundhouses, brochs are said to "...suggests that buildings were designed to be occupied by extended families…" (*ibid.*). Ascribed to brochs are functions that do not sound out of place to those ascribed to hillforts, such as: centres for elites although not at the level of chiefdoms; control of agricultural surpluses; and places of ritual activity (Sharples 2010, 312; and Dockrill 2002, 159 and 162).

Crannogs are a feature of Iron Age occupation in Scotland and are widely distributed (Toolis 2015, 19). This form of site is absent, excluding Llangorse Lake, south of the Solway, although plenty of suitable locations in the Lake District NP exist for such dwellings (Dixon 2004, 26 and Toolis 2015, 19). As previously observed, this marked contrast is also noticeable for hillforts but not as complete as for crannogs. Given their location, they are unlikely to have been ploughed out or subsequently been developed; although this was asserted with regards Scotland, it is equally applicable elsewhere in Britain (Toolis 2015, 19).

Areas of significantly low levels of roundhouses in Scotland can be found in the following areas, as with hillforts:

- Forest of Bowland AONB.
- An area centred upon the Cairngorms NP.
- Galloway Forest Park.
- Loch Lomond and the Trossachs NP, although a small number are to the south in Stirlingshire.
- Western Highlands, except for the coast.

(c) Wales

Very little is actually known of Bronze Age settlement in Wales and the Welsh Marches; but as with other upland areas when the roundhouses are dated, they could prove to be of Bronze Age date (Darvill 2002, 115). Such a, farmstead and associated enclosure have been dated before 1000 BC at Pentre Llyn Cymmer, Clwyd (Manley 1989, 104). Whether Darvill's (2002, 115) assertion that many of the undated roundhouses and field systems in upland areas will date from the latter part of the second millennium to the early first millennium BC remains to be seen though.

The Welsh Roundhouse Project, funded by The University of Wales Board of Celtic Studies, aimed to analyse the data from all excavated prehistoric and early historic roundhouses (Ghey *et al.*, 2007). All the data from excavated roundhouse settlements in Wales was to be identified and made available in full from the Archaeology Data Service as a resource for fellow researchers. Though the project was broader in temporal terms than the remit of this thesis, it includes the later prehistoric and early historic settlement practices; it is still an invaluable resource. The data is, in turn, presented in three sections: chronology; inhabitation and landscape; and historical overview. In retrieving a more accurate understanding of roundhouse occupation, there was a bias towards excavated sites with good chronologies.

Ghey *et al.* (2007) observe that the form of the roundhouse has early origins and that there appears to be a growth in numbers post 1500 BC, with it becoming a characteristic of the first millennium BC in Wales. Possibly, as previously related, due to the increased dependency on a sedentary agricultural lifestyle which occurred from the Middle Bronze Age onwards. Timber and stone were utilised to construct settlements during this period, though regional preferences exist for stone and clay in northwest Wales (*ibid.*). From a position of a focus on enclosed settlement types at the start of the period, there was a move to more open settlement types and a notable absence of roundhouses in northeast Wales by the Roman period (*ibid.*).

In the Welsh lowlands, finding evidence of farmsteads is much more difficult (Manley 1989, 104). One such site, though, has been identified at the Atlantic Trading Estate, Barry, Vale of Glamorgan, which dates from the Early Bronze Age to the late Bronze Age. Despite this paucity of evidence, Davies (1995, 671) considers that most Welsh sites occupied lowland settings, which seems reasonable given the land's greater carrying capacity. In the study area, evidence is somewhat limited to the Levels.

Contrary to popular thought, they are not always round, as recently demonstrated in the Gwent Levels, where rectilinear structures were found.

Northwest Wales, including Anglesey (Ynys Môn) and the Llŷn Peninsula (Penrhyn Llŷn), has a relatively coastal distribution of hillforts and roundhouses. The stretch centred upon the Menai Straits (Afon Menai), and Anglesey has a significantly higher concentration of roundhouses when compared to hillforts. The general distribution of the roundhouse is similar to that of hillforts. However, they can occasionally appear relatively isolated from any hillfort, such as the roundhouse at Pen Y Wern, Powys (CPAT 6434).

Areas of significantly low levels of roundhouses in Wales can be found in the following areas, as with hillforts:

- Black Mountains (Y Mynydd Du), east and west, although some are present on the outer margins.
- 'Central Cambrian mountain core' or mid-Wales uplands.
- Sennybridge Training Area (MOD).
- Eryri NP (Parc Cenedlaethol Eryri).
- South Wales Coalfield.

Roundhouses of Southeast Wales: the data

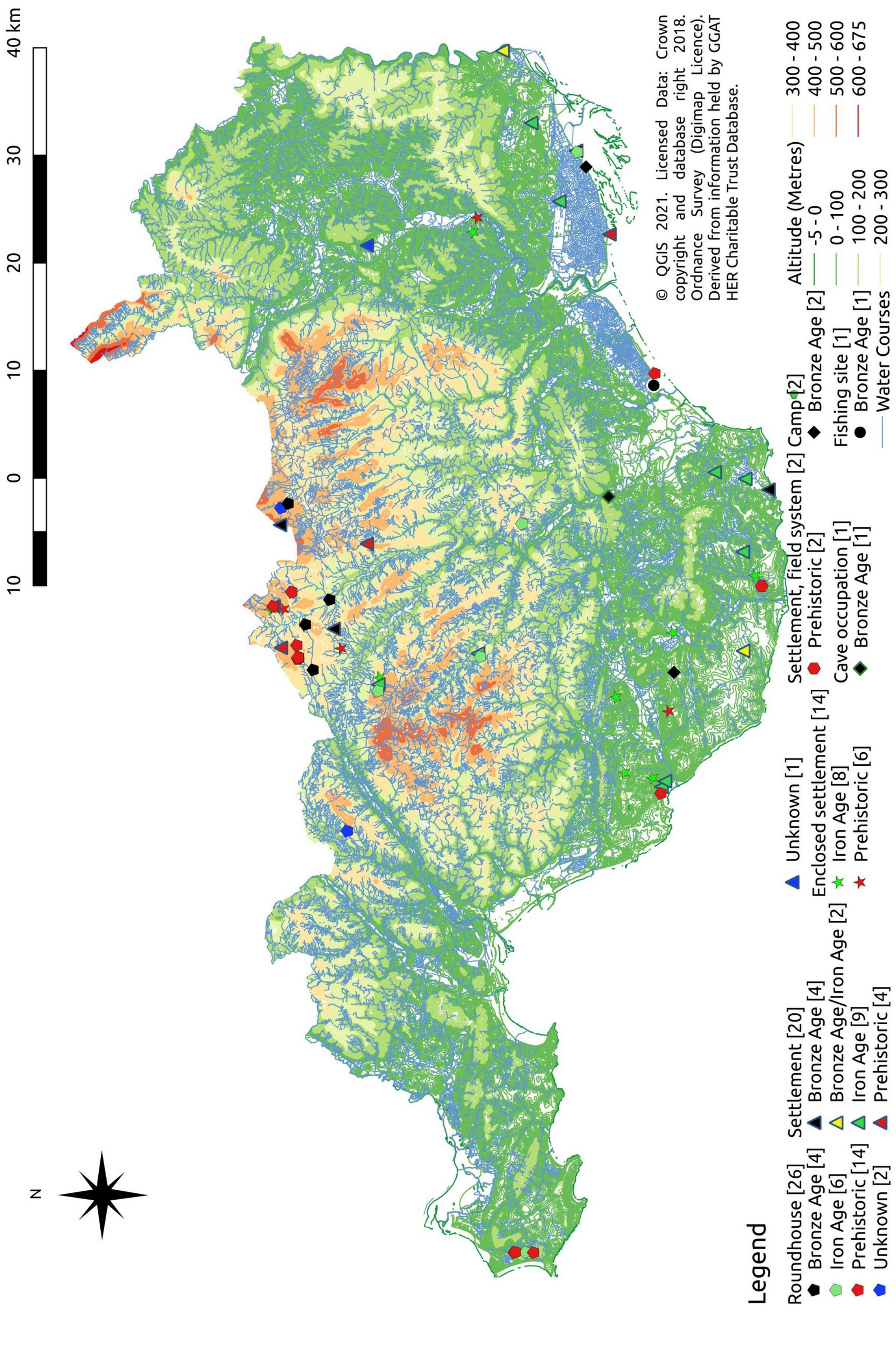
The data had to be standardised here as the HER, as maintained by GGA, used various nomenclature; for example, enclosure/defended settlement when enclosed settlement would have sufficed, such as at Coed Y Fon (GGAT 06163g). Additional categories include hut, hut circle, hut circle settlement, enclosure, hut platform, roundhouse, settlement, and settlement, enclosure, for the differing types of settlement. These categories were simplified to roundhouse (representing a single dwelling), enclosed and settlement to avoid confusion. The less pejorative term, roundhouse, was utilised instead of hut because of the negative connotations associated with the former term. The term camp was applied to the sites where occupation was light and of short duration (see Figure 14).

The region, concerning Cardiff and the Vale of Glamorgan, although probably equally applicable to Glamorgan as a whole, and Gwent is portrayed as monopolised by enclosed settlements (Davis 2017, 350). Nevertheless, this can hardly be considered representative of the Iron Age (*ibid.*); occupied by individual extended families probably occupied these enclosed settlements (RCAHMW 1976, 10 and Davis 2017, 328). Given that in northwest Wales, the settlement pattern, in places, featured several unenclosed sites during the Iron Age (Mytum 2018), it would appear that they are significantly under-represented in southeast Wales. Even the terminology used, 'unenclosed' implies that they are somewhat unusual rather than the norm (*ibid.*) and may indicate a degree of bias.

A group of settlement sites appears to correlate with the hillfort Group 6 centred upon Llwyn-onn, highlighted in Chapter 8. The Taff Fawr Valley moving northwards until it becomes the Tarell Valley provides a natural route through this area and could have provided a route to access summer grazing in the Brecon Beacons. Alternatively, the area could be accessed from the north via the Tarell Valley route from the former county of Brecknockshire. Given the similarity of the topography in the broader area, one would expect a similar distribution of such sites unless something else is at play here, such as the aforementioned route. This locale also has a significant concentration of clearance cairns and cairnfields.

Open settlements have received little attention, probably due to the paucity of identifiable sites, though the absence of evidence does not preclude their existence. For example, open sites may have been ploughed out, particularly given the arable nature of much of Monmouthshire and the Vale of Glamorgan. Furthermore, their 'lightly-built' nature and the subsequent ploughing or subsoiling of such sites are unlikely to generate cropmarks (Halsted 2007, 62; Bell *et al.* 2013, 8; Harding 2015, 15; and Davis 2017, 341). The more substantive, in archaeological terms, enclosed sites will, therefore, feature more strongly in the evidence base, much to the detriment of the consideration of open sites. Wigley (2007, 175) observes, albeit regarding the Marches, that mediaeval cultivational practises and post-mediaeval agricultural improvement removed much of the evidence of such sites, which is particularly so in low-lying areas, exacerbated by the post-Second World War drive to intensive arable production.

Figure 14: Southeast Wales: domestic



This apparent dearth of open settlements and the purported low population levels of western Glamorgan could be addressed by identifying further open settlements (Davis 2017, 331). Where they have been observed, in the southern part of Glamorgan, there is a tendency towards clustering on the lower lengths of rivers, in the south and east; whilst, in the west and centre, the tendency is towards the source of water courses or the coast (Davis 2017, 331 and Evans 2018). In the Gwent Levels, there appears to be no evidence for the enclosure of such settlement sites and this may be indicative of the occupation associated with the seasonal grazing of land held in commons (Evans 2018) or, alternatively, that the evidence has simply not been found yet. This narrative by Evans (2018) is dependent on enclosed 'defended' farmsteads outside the Levels.

When one looks to the HER, the picture contradicts that of the accepted view in that, for the region, there are 45 of what one could class as open settlements, that is, roundhouses and settlements, as opposed to just 14 enclosed settlements. Davis (2017, 337) has identified 69 potential enclosed sites, which constitute 45% of the total number of sites for the Vale. Of these sites six were hillforts recorded as enclosed settlements: Llanquian Wood (1615), Llantrithyd Camp (1624), Mynydd-y-Fforest (1613), St Mary Hill Down (1573) and Wenallt Camp (1801) all recorded as confirmed hillforts in the Atlas (Atlas 2024 and Davis 2017, Appendix 1). Mynydd Ruthin (1574) was recorded as a hillfort, although unconfirmed (*ibid.*). Such a difference is reflective of the different approaches of what constitutes hillfort and affirms the need for clear definitions. The use of this data would skew the results for the southeast Wales region and, furthermore, may not reflect other parts of the region with different topographies, such as the Levels, as it is limited to the Vale.

GGA undertook a project 'Southeast Wales Prehistoric Defended Enclosures', which has now concluded. The term prehistoric defended enclosure was taken to include "hillforts, … coastal promontory forts, ringworks and lowland defended sites" (Wiggins 2006. 3). Such a definition is too broad and incorporates a number of monument types. Given that the project incorporated data from prehistory as a whole, differed from both the HER and NMR on occasion, with regards the period and interpretation of the site, meant that it was inappropriate to incorporate the dataset wholesale. Such an example, Corntown Farm is referred to and results in the following:

1) An unknown enclosure (GGAT 00870m) that is probably a Romano-British farmstead.

2) A farmstead of an unknown period (NMR 300341).

3) Defended enclosure with reference to 'Southeast Wales Prehistoric Defended Enclosures' project (Gerrard *et al.* 2006).

4) Potential enclosed Iron Age site (Davis 2017, Appendix 1).

Inevitably relying on the HER will mean that some sites will be missed, but the HER provides the most comprehensive regional coverage.

Domestic 65 sites (N.B. The following do not form a total breakdown of the Broad Class Domestic):

- Enclosed settlement 14
- Roundhouse 26
- Settlement 19

Direct comparison with Davis (2017) cannot be drawn, though, as his works covered a much smaller area, i.e. Cardiff and the Vale of Glamorgan, and was limited to the Iron Age. Many of the sites identified in the HER are assigned to prehistory, Bronze Age or Iron Age solely based on their form. However, with that caveat in mind, one can see that enclosed settlements (14) are predominantly Iron Age, with over 57% of sites and the remainder assigned to prehistoric, which may or may not be subsequently assigned to the Iron Age, Bronze Age or even a completely different period.

In terms of roundhouses (26), the percentages are:

- 15.4% assigned to the Bronze Age,
- 23.1% Iron Age,
- 53.8% prehistory and,
- 7.7% unknown.

With regards to open settlements (including roundhouses (45)):

- 17.4% assigned to the Bronze Age,
- 4.3% Bronze Age/Iron Age,
- 32.6% Iron Age,

- 39% prehistoric and,
- 6.5% unknown.

As can be seen, if one precludes hillforts and promontory forts, the dominant form of settlement was open, and most such sites date to the Iron Age. If the assignation of the sites to the various periods is considered to be remotely accurate, it indicates an intensification of occupation through time. However, this should be treated with caution as not all of these sites will have been contemporaneous, and many may have experienced multi-period occupation, with periods of abandonment, which could also apply to the Bronze Age.

Davis observes (2017, 331) the presence of ‘blank areas’ regarding the higher areas of western Glamorgan and, with particular reference to the area around Llandow and Wick. These blank areas would seem irrational from a purely agricultural perspective, given their high level of productivity today and, as such, was probably so in prehistory. Given the presence of several round barrows on the periphery of this area, we may be witnessing the avoidance of this locale, which may have been deemed inappropriate for settlement or farming for some unknown reason. Corntown causewayed enclosure (GGAT 00871m and GM585) to the north may indicate the area had some significance even in the Neolithic. The surrounding barrows would have had a greater prominence in the landscape in the Late Bronze Age than today, emphasising the significance of this area. Without monuments, oral traditions could have precluded settlement or farming in this ‘blank area’. The lack of settlements is even more puzzling when considering five large hillforts of over 6 ha surround it, with the coast, to the north and east. As such, one would have expected open or enclosed settlements in their vicinity. On the periphery of this ‘blank area’ was, nevertheless, an open settlement at Llanmaes, consisting of two roundhouses, dating to the Bronze/Iron Age transition (1190 – 930 cal. BC that were found beneath the middens here (Madgwick and Mulville 2015, 632 ; Gwilt *et al.* 2016, 303; and Burrow 2020, 84)).

Llanmaes is approximately 500 metres from some round barrows and appears to have been a focus for ritual feasting practices, dating from the Bronze Age-Iron Age transition, and would have facilitated intra-/inter-community involvement at the local or regional level, which could presumably have encompassed at least part of southeast

Wales (Needham 2007, 58 – 9, and Madgwick and Mulville 2015, 630 – 1). This area of Bronze Age ritual significance, as evidenced by the presence of round barrows, would still have meaning from the later Bronze Age onwards. Such midden sites are seen as representative of a new order based on food production, with the demise of the bronze standard and its associated trade networks, leading to social change (Needham 2007, 58 – 9).

Midden sites show a differential bias in the bone assemblage and an overwhelming number of specific body parts compared to other sites of the period. In that pig tends to predominate, at 71% of the identified specimens, and the right fore quarter respectively, 68.5% of the quarters present, as evidenced at Llanmaes (Madgwick and Mulville 2015, 632 – 3). Middens located elsewhere, however, share a similar concentration of pig in the bone assemblage, but not to the same extent as Llanmaes (*ibid.*). The site appears to have functioned as a meeting place in the landscape, which is supported by strontium analysis that demonstrates a number of the pigs originated from different areas, which were greater than 20 km away from the site (*ibid.*, 636 – 9). During the 2006 excavations, 240 copper alloy fragments, including cauldron fragments, and 187 iron objects were found (Gwilt *et al.* 2006, 45 – 6). Adjacent to Llanmaes, within 500 m, is a univallate Late Iron Age/Romano-British enclosure and Early Bronze Age round barrows that demonstrate the significance of the sites' location in later prehistory (Lodwick and Gwilt 2011, 33; and Madgwick and Mulville 2015, 631).

Agriculture

Site types were taken directly from the HER's 'Broad class' classifications from within the dataset provided by GGA. The broad classes include:

Agriculture and subsistence 71 sites:

- Clearance cairns and Cairnfields 55
- Banjo enclosure 1
- Field system and boundaries 15

When discussing prehistoric field systems, Hamilton (2004, 103) notes that large-scale excavations at Roman sites, such as Caerwent, Caerleon, Monmouth and Usk, have not produced any evidence for field boundaries. The Levels may reveal significant evidence for prehistory concerning the means of enclosure, should it exist, and the agricultural exploitation of this area. However, development is limited in the area because it is a Site of Special Scientific Interest; an Archaeologically Sensitive Area; present on 'The Register of Historic Landscapes in Wales'; and has been identified as an area at significant risk of flooding. These factors mean that any proposed development is generally directed elsewhere, thus precluding developer led excavation.

Clearance cairns

Clearance cairns are common at many Bronze Age agricultural sites in marginal stony upland areas in Wales, such as the Denbigh Moors, indicating intensive exploitation. Gwent strangely has a virtual absence of clearance cairns in stark contrast to Glamorgan that may be as result of the prevailing topography, a reflection of research levels or a combination of the two (Hamilton 2004, 103 – 4). The level of effort involved in creating cairns as part of a clearance program seems implausible if one considers that it was purportedly to provide rough grazing, indicating that their *raison d'être* was something more than purely functional clearance. Due to the altitude, transhumance may have been practised, utilising the upland pasture in parts of the Welsh uplands during the summer months. Manley (1990b, 524) concludes that transhumance was probably practised at Graig Fechan, Denbigh Moors primarily due to the lack of finds. However, there is evidence of field systems and huts, one dated to between 1200 and 800 BC, which are typical of an upland pastoral economy (Manley 1990b, 517 and 524). If the land were farmed on a communal basis, in conjunction with adjoining or neighbouring areas at lower altitudes, it would in all probability be viable on a transhumance basis. Again, this exploitation of liminal areas may have occurred from adjacent 'dry land' areas in to the Levels.

Field systems in the region

There has been a general presumption against the presence of fields in the region, with particular reference to the Vale (Davis 2017, 343). Furthermore, it has been commented upon that the absence of evidence may well be due to the lack of research into such matters within southeast Wales (Davis 2017, 343 and Bell *et al.* 2013, 343). Bell *et al.*

(2013, 343), opine that the environmental evidence is indicative of rough grazing for the Bronze Age, in lowland areas, and of a lower intensity of use particularly when compared with southeast England. Despite this lack of evidence, in Gwent, a number of possible locations for fields have been observed at Gray Hill, Monmouthshire, Newhouse Park, Cleppa Park and Thornwell Farm, Chepstow (Bell *et al.* 2013, 294, 300, 302 and 303). Whilst in the Vale 23 such potential field systems have been identified likely dating to later prehistory (Davis 2017, 345). At Penllyn, Cowbridge, consisting of 24 ha, is a series of small fields demarcated by lynchets, which are cut by a Roman road, and therefore indicate that the lynchets are from an earlier period (*ibid.*).

Davis (2017, 345) considers that RAF St Athan provides the most persuasive evidence yet for the presence of Middle Iron Age fields in the Vale. The settlement at St Athan is believed to have been occupied between 200 BC and 50 AD, possibly earlier (Barber *et al.* 2006, 80); although Davis (2017, 345) considers a 1st century BC date probable for the establishment of the enclosure. However, a radiocarbon date of 760 – 370 cal. BC was produced from a charred cereal grain, albeit the grain could be residual, in primary silt from the ditch surrounding the enclosure (Barber *et al.* 2006, 56). The ditches associated with the proposed adjoining field system appear to represent agricultural plots and the molluscan evidence indicates that they were utilised as pasture as opposed to arable (*ibid.*).

Pastoralism

Intensive livestock farming for most areas lasted from c.1500 to 500 BC (Pryor 1998, 13). Sheep would have been utilised for more than just the meat they could provide, but also for dairy products and wool. Davis (2017, 330) considers the view that the land was only suitable for pastoralism, with reference to the Vale of Glamorgan, as being counter-intuitive due to the productive nature of the arable land present here today, which was presumably so in prehistory. This assertion is also equally applicable to a large proportion of Gwent. The supposition that pastoralism was pre-eminent is therefore open to question, particularly as farmsteads would, in all likelihood, have practised mixed farming to a greater or lesser degree. The more marginal areas of the region may have been better suited to pastoralism, which in the southeast Wales region would include the Levels and upland areas. Most farms were probably located along a spectrum between arable farming at one end and pastoralism at the other though.

In the very broadest sense, some have associated, from a chronological perspective, the keeping of cattle with the Early Neolithic, pigs with the Later Neolithic, and sheep to the Bronze Age and Iron Age, with sheep gaining in importance towards the end of the Iron Age regionally (Albarella 2007, 389 and 398). There would be significant regional differences and even intra-regional differences though. For example, sheep would be more suited to marginal upland areas than pigs. Unfortunately, the limited evidence from Early Iron Age non-hillfort sites limits the potential to understand animal husbandry and seasonal regimes, such as transhumance (Davis 2017, 349). The premise of transhumance, suggested by isotopic evidence, was also noted when referring to the predominance of cattle bones, from the Late Bronze Age, at Peterstone (Bell *et al*. 2013, 249).

Temporary camps dating from the Middle Bronze Age have been evidenced by the presence of domestic fires at the site of the Western Valley Trunk Sewer, Wentlooge that could be associated with seasonal grazing practises (Caseldine and Druce 2001, 72 and Bell *et al.* 2013, 128). Such camps may also be evidenced by stake-built structures, which could be erected rapidly (Burrow 2020, 74). An example of such a structure from the Middle Bronze Age, constructed for a single person, was located at Rumney 6 and comprised 17 split-alder stakes (Nayling 1999, 39 – 51 and Burrow 2020, 75). Additional evidence, in the form of bovine hoof prints in at least four separate locations in the Gwent Levels (Archwilio 2020), clearly shows the presence of livestock that would support the transhumance hypothesis (Bell *et al.* 2013, 128). Caseldine (2018) concludes that due to the high number of animal bones from juveniles present at Goldcliff that there was movement from dryland to wetland, which would have occurred in the spring and early summer.

Subdivided rectangular buildings at Goldcliff, Redwick and Cold Harbour in the Gwent Levels are thought to be indicative of stalls for housing cattle, and similar structures have been found on the Continent, although not in the British Isles (Bell *et al.* 2013, 156). In support of this stance, within the buildings present on site were mites associated with cattle dung and lice, which along with the size of the entrance are taken as being indicative of the presence of calves (Caseldine 2018). Such stalls, could indicate the level of stock control necessary for the dairying of cattle and their presence in the Levels necessary for exploiting what would effectively be a natural water meadow in the Spring.

Once the cereals were harvested, cattle or sheep could graze the stubble and weeds , a helpful source of fodder at a time of year when grass grows poorly (Caseldine 2018). The added advantage is that the fields are cleared and manured, ready to sow another crop. Caseldine (2018) has opined that barley could have been utilised as a fodder crop for cattle and, as such, may have featured more significantly in more pastorally based areas. For much of Wales, pastoralism it has been suggested was the dominant form of farming practised, except in the coastal margins and lowland areas, where cultivation featured more strongly (*ibid.*).

Cattle were also utilised as draught animals and increasingly for dairy production. Evershed *et al.* (2008, 901) demonstrate that at Brean Down, a Bronze Age site, 59% of the lipids detected from potsherds resulted from dairying. Furthermore, it was observed that dairying in England had taken place since the fifth millennium BC. It was also argued that neonatal and young animals being present in the assemblage indicates dairying and transhumance practices, assuming spring calving (*ibid.* 249), but this is not to say that the wetland area was not utilised at other times, as there is evidence to indicate that this occurred (Caseldine 2018).

There is no apparent association of species discrete bone assemblages with the different settlement types (Albarella 2007, 394). Departing from that of southern Britain cattle feature strongly, as opposed to sheep, in at least two hillforts in southeast Wales (Jones 2014, 51 and Davis 2017, 349). More specifically, Hambleton (1999, 98), in terms of Wessex and central southern England, observes that hillfort faunal assemblages contain higher percentages of sheep than enclosed and open sites. Elsewhere, the range of species represented is broad across the range of site types, excluding banjo enclosures (*ibid.*). Banjo enclosures, a circular enclosure with two broadly parallel ditches forming an avenue, are another enclosure indicative of stock control (Darvill 2002, 139). With banjo enclosures, associated with stock corrals, sheep tend to predominate the assemblages (Hambleton 1999, 56 and Albarella 2007, 394). Only one has been identified within the region and then not definitively so at Rockfield Farm, Undy, Monmouthshire (GGAT 11484g). It has been suggested by Mytum (2018) that instead of ditches, hedges or fences may have been employed to the same effect. It could explain their apparent near absence in southeast Wales if this were the case. However, it does not preclude the likelihood of a means of enclosure during later prehistory in the Levels, perhaps related to transhumance practices or the dominant position of hillforts in keeping cattle. Cheese and butter could have been traded, but local production and consumption are likely, and one only has to look to pre-Agricultural Revolution agrarian practices to substantiate this stance. This premise does not preclude the wholesale movement of livestock, as high-value items, by driving them to market, feast centres or for seasonal grazing.

In Wales, mainly in upland areas, acidic soils, such as podzols, tend to preclude the presence of bone resulting in fragmentary deposits that are too small to identify the species (Bell *et al.* 2013, 147; Caseldine 2018; and Davis 2017, 347). In terms of southeast Wales, cattle bones dominate the assemblage for the Neolithic and Bronze Age at Peterstone and the Iron Age at Goldcliff (Bell *et al.* 2013, 248). Bone preservation at Caerau hillfort is particularly poor due to acid soils underlain by clay and could explain this species differential, at least in part.

The paucity of evidence in the Vale is evidenced by, that at the time of writing, '*Filling the Gaps: The Iron Age in Cardiff and the Vale of Glamorgan'* only ten animal bone assemblages were available in the literature and nine sites where no analysis has been performed (Davis 2017, 347). Jones (2023, 11) observes, with reference to South Wales, that the dataset for faunal assemblages is limited for the Iron Age. At the midden site in Llanmaes, Vale of Glamorgan, the bone assemblage comprises mainly of pig, whilst cattle and sheep/goats form the bulk of what remains (Caseldine 2018). The dominance of pig, in particular the right fore-quarter, in the assemblage is considered indicative of feasting and not representative of farming practices (Madgwick and Mulville 2015, 641; Gwilt *et al.* 2016, 308; and Davis 2017, 349). A radiocarbon date obtained from a pig bone at Llanmelin Outpost, Shirenewton, which was taken from the lower fill of a south-facing ditch, resulted in a date from the Middle Iron Age (Carruthers 2023, 94).

Albeit based on modern species, “...lactating cows need between 60 to 100 litres of water per day, while lactating sows and gilts may require 15 to 30...” (Agriculture and Horticulture Development Board 2024). Department of Agriculture, Environment and Rural Affairs (DEFRA) clearly show the higher demand of cattle for water per head than pigs or sheep (see Table 2).

Table 2: Water requirements by species

Cattle	Amount of water (litres/day)
Cow with calf	50
Dairy cow in milk	68 –155
Yearling	24 – 36
2-year-old	36 – 50

Pigs	Amount of water (litres/day)
Lactating sow	18 – 23
Gestating sow / boar	13 – 18
Fattening pig	3 – 10
Weaner	1 – 3

Sheep	Amount of water (litres/day)
Ewe with lamb	9 – 10.5
Pregnant ewe / ram	4 – 6.5

(DEFRA, 2024)

Even when allowing for the greater demand for water by modern species used in farming, the demand for water would be significantly higher for lactating cows than other stock species. This disparity would be tempered somewhat by the reduction in size of cattle with domestication from the Neolithic to the pre-Roman Iron Age (Bartosiewicz *et al*. 2005, 29 and Manning *et al*. 2015). Given the suggestion of dairying taking place, a good water supply would be essential for ensuring milk yields.

The recovered bone assemblage at Caerau (Ely) dates to the site's Iron Age and Roman phases and primarily featured cattle with sheep at 37% and 28%, respectively (Jones 2014, 49). However, the preponderance of more robust material and quantity of unidentified species, at 88% of the bone assemblage, mean that any conclusions should be considered tenuous (Jones 2014, 49). At Llanmelin Hillfort, Monmouthshire, cattle also feature prominently in the faunal assemblage at 51% of classifiable skeletal material followed by sheep at 34% and pig 10% (Jones 2014, 51 and Davis 2017, 349). This could indicate a degree of specialisation, such as dairying, at hillforts which is suggested by the dominance of mature animals in the assemblage at Caerau (Jones 2014, 52 – 3). However, the poor preservation of bone here may be masking the true age range here by favouring more mature specimens (*ibid.* 51). Such functionalist approaches may not explain this situation entirely, as cattle could represent status for example. Additionally, these bone assemblages may indicate cattle were dominant in the hillfort agrarian economy of the southern coastal strip of Wales, as opposed to sheep in southern England. Davis (2017, 349) tentatively suggests that this may reflect a general pattern of cattle associated with hillforts, given the predominance of cattle in the bone assemblages from Llanmelin and Caerau.

The presence of calcined bones at Caerau hillfort is a strong indicator that animals were butchered and eaten here. The primary source of animal protein is likely to have been from cattle as they were both dominant in the assemblage at 37%, with sheep accounting for 28%, and that cattle are substantially larger than sheep (Jones 2014, 49). It was also suggested that the presence of mature sheep in the assemblage may indicate the production of wool, but this could equally relate to the production of ewes' milk (Jones 2014, 51). Davis (2017, 349) proposes that the dominance of mature animals in the bone assemblage, whilst referring to Caerau, may indicate dairying within hillforts. Given that not all hillforts were contemporary and that they appear to have served differing roles, a degree of specialisation should not be surprising (Mytum 2018). For example, some hillforts appear to exhibit signs of dense occupation, whilst others evidence none or few structures (*ibid.*). It is plausible that at least some of those hillforts with few or no structures may have played a role in the keeping of livestock.

The faunal assemblages from both RAF St Athan and Llancarfan have been utilised to argue for changes in emphasis in livestock management for the latter half of the 1st millennium BC because of the dominant presence of sheep and exploitation of horses (Davis 2017, 53). Due to the small assemblage for each of the periods at RAF St Athan, the overall assemblage was just 241 fragments, and high potential for residual material within the Roman assemblage limit its evidential worth (Higbee 2006, 91). As such, Higbee (2006, 94) does not try making "...comparisons between periods or between sites at the intra-regional level." In terms of age ranges for the various species it is deemed to be "...of limited interpretive value" (*ibid*). Except for one piece of horse pelvis, found in a Middle to Late Iron Age context, the remainder were from the Roman period onwards (Higbee 2006, 93). Davis (2017, 53), observes "A change in focus from cattle to sheep farming was also noted at Caerau hillfort during the Romano-British period." However, Jones (2014, 53) is far more cautious, due to the limited size of the assemblage for this period, and asserts that such observations are 'exceptionally tentative'.

The bone assemblage at Whitton, for the pre-Roman and Roman periods, was distributed at broadly equal levels across sheep, cattle and pigs, although this assertion must be qualified by the fact that all unstratified bone had been discarded (Jarrett *et al*. 1981, 251). Furthermore, differential preservation may have favoured the preservation of the more robust bones in the assemblage. In terms of the overall meat production, cattle represented 68% of the total with pigs and sheep at about 10% each (*ibid.*). At the time of slaughter, pigs were immature, whilst sheep and cattle were allowed to reach maturity (*ibid.*). This maturity of the sheep is said to be indicative of milk and wool production, along with meat (*ibid.*). Wool production is evidenced here by the presence of spindle-whorls and bobbins here (*ibid.*). Fifty percent of the cattle were in excess of 2yrs in age, the age by which meat production would be maximised, and as such indicates that dairying was practised here (*ibid.*). As previously observed, the presence of mature cattle may be seen as a status symbol and should not be viewed in a purely functionalist fashion.

A different narrative is adopted by Evans (2018), albeit in a paper on Romano-British settlement in southeast Wales, in which specific enclosed sites are thought to relate to stock enclosures. Such sites include an inner smaller enclosure, surrounded by a bank, with an outer enclosure, therefore not banjo enclosures. The smaller of the two enclosures is usually considered to be a farmstead, with the outer for stock management (*ibid.*). Davis (2017, 339) points out that such features are 'not prevalent' in the Vale of Glamorgan and Cardiff. Given the purported primary role of pastoralism, one would assume that they would be a relatively common feature, not just in Glamorgan, but within the southeast Wales region as a whole. Two sites were identified as having the pre-requisite "…wide-spaced concentric boundaries…" Llanquian Wood (GGAT 00327s) and Hilton Farm (*ibid.*).

Some differences could be accounted for by the emphasis of the respective papers, in that Davis (2017) is addressing the Iron Age, whilst Evans (2018) the Romano-British period. Their differing geographical coverage, Cardiff and the Vale of Glamorgan, and southeast Wales, respectively may also account for some disparities. However, given that many of the sites are multi-period, the differing time frames alone do not explain this difference of opinion. Evans (2018) believes that nearly 25% of enclosures in Glamorgan accord with this form and that Y Bwlwarcau (GGAT 00116m) is a prime example. In Gwent, the form features less, at only c. 10%, in terms of enclosed sites, which Evans (2018) explains as a result of ploughing removing the outer ditch or that they were removed as a conscious effort. Neither of these solutions adequately explains why Gwent should be so different from Glamorgan in this respect. Was the pastoral economy in Gwent simply less reliant on such enclosures as a reflection of how pastoralism was practised here? On a cautionary note, the absence of these features does not preclude the presence of stock. As Whitton (GGAT 00382s), for example, had one enclosure and yet cattle were still present. Evans (2018) considers that such enclosures were defensive to deter cattle raiding; however, stock management may have been the intention here.

At Goldcliff, the assemblage is dominated by cattle (58%), even when allowing for differential preservation or recovery bias or carnivore damage or both, this differs from other assemblages in Iron Age Britain where goat/sheep (8% at Goldcliff) appear dominant (Hamilakis 2000, 277 and 279, and Bell *et al.* 2013, 248). Given the location of the site, it must be borne in mind that cattle may have been better suited to grazing in such an estuarine marsh environment; although at Meare East, Somerset Levels, within similar environmental constraints, sheep/goats were dominant (Hamilakis 2000, 279). As such, this does not totally explain the low levels of sheep/goat here (*ibid.*). Additionally, it does not explain the absence of porcine skeletal remains given their suitability for such conditions and their presence elsewhere in the region, such as Llanmaes and Llanmelin (*ibid.*).

Arable Farming

Even though querns "…are not uncommon…" Cunliffe (2005, 299) considers the absence of field patterns indicative that arable farming "…may have been subservient…" to pastoralism. Despite the assumption by many authors that the region was reliant primarily on a pastorally based economy, in prehistory, this stance in the main is not evidenced. The absence of field systems is equated to the presence of pastoralism. This view has been questioned on several grounds from the functionalist nature of the assumptions made, in that the growth in the number of fields is related to population growth and the need to assert ownership of the land, a resource under growing demand, and the requirement that to increase agricultural productivity it necessitated the presence of fields. This view draws on the 'Agricultural Revolution' paradigm, which is inappropriate in this context (Sharples 2010, 41). Given that arable farming practices, even in a historical context, were often not reliant on fields, such as in the case of the mediaeval 'open field system', which sustained relatively large populations, making such generalised assumptions questionable. Furthermore, the absence of cereal pollen does not preclude arable farming practises due to the "…production and dispersal characteristics…" of the cereal pollen, particularly if production was at a relatively small scale. Furthermore, if the pollen source was relatively distant from where the sample was taken (Caseldine 2018).

Midden material has been used for manuring from the Late Bronze Age onwards at some sites. However, Reynolds (1995, 183) states that there is little evidence for middens or manure heaps at enclosure sites, although more recent evidence may suggest otherwise. As arable farming intensified through the Bronze Age, midden material was used, its principal constituents being the manure from herbivores and ash.

In terms of cereal growing in south Wales, this has also been evidenced at Penycoed, Carmarthenshire (PRN 10097), albeit outside of the region, and Thornwell Farm (GGAT 04441g), Monmouthshire (Caseldine 2018). Cereal cultivation was less important in the northern and eastern areas of Wales during the Iron Age and Romano-British periods (Caseldine 1990, 92); therefore, one would assume there was a greater reliance on pastoralism in the aforementioned areas. In light of current evidence, this assertion should be revised. Assemblages in the Vale tend to be monopolised by spelt, although emmer and possibly oats, from Caerau Hillfort, have been observed (Wessex Archaeology 2013, 13 and Davis 2017, 346). Carbonised plant material from Nurston produced: spelt wheat; possibly bread wheat and barley; and oats, although without the presence of chaff it was impossible to determine whether this was wild or cultivated oats (Evans and Swords 2001, 170 and Davis 2017, 346). From context 014, an amount of pottery of Late Iron Age date was excavated, including a high shouldered jar rim (Evans and Swords 2001, 168). A carbonised cereal grain, dated to 760 – 370 cal BC, found in 'primary silt' in an enclosure ditch at RAF St Athan is indicative that this did not form part of later intrusive fill (Barber *et al.* 2006, 56 and Davis 2017, 346). At Whitton, the cereal grains included oats and emmer, although it has been postulated that barley and bread wheat were also grown here (*ibid.*). The use of such environmental evidence in archaeological publications for 'dryland' Gwent is notably absent, which could highlight local variations (Hamilton 2004, 106). This absence contrasts markedly with the amount of evidence in the Levels with its "…abundance of recently discovered Bronze Age sites" (Bell *et al.* 2013, 1).

The presence of querns within the region, along with grain, clearly demonstrate that grain was being processed and grown here (Jarrett *et al.* 1981, 251). Furthermore, their presence in both lowland and upland areas (Sudbrook Camp at 10 m and Twyn Y Gaer, Llanfihangel at 426 m, respectively) within the region indicate that arable farming was widespread here during prehistory (Howell and Pollard 2004, 151 – 53 and Lancaster 2012, 12). Rotary and saddle querns have been retrieved from Caerau Hillfort (Wessex Archaeology 2013, 6 – 11, and Davis 2017, 347).

Querns have formed part of the finds assemblage at: the Atlantic Trading Estate, Barry; Biglis, Vale; Coed y Cymdda, Vale; Great House Farm, Llanmaes; Llanmaes midden; Mynydd Bychan, Neath Port Talbot; and Whitton, Vale of Glamorgan (Davis 2017, 347 and Caseldine 2018). The majority of which, however, appear to be from a Roman context and therefore do not form part of the later prehistoric assemblage. For example with regards: Biglis, the majority were Romano-British with one imported Mayen lava quern, usually seen in a military context (Parkhouse 1988, 61); the quernstone from Llandough, was found in Context 124, which belonged to the later villa phase (Owen-John 1988a, 173); of the six quern fragments found at Whitton only one is found in Iron Age contexts in the UK (Welfare 1981, 224); and a fragment of rotary quernstone found at the Atlantic Trading Estate is of an unknown date, although its form is comparable with Roman examples from Sudbrook and Caerwent (Sell 1998, 24). With regards Whitton quernstone 5, the only Iron Age phase here is Phase 1 from A.D. 30 – 55 and the stone in question was found in an unstratified context (Jarrett *et al.* 1981, 84 and Welfare 1981, 224). Coed y Cymdda, it has been suggested, by Owen-John (1988b, 76 and 74), had only "Sporadic activity, insufficient to suggest settlement." for the entirety of the Iron Age, although a possible "... rotary quern should be associated with some later (?)Iron Age or Roman activity". Furthermore, it has been asserted that querns have been retrieved on every site where the excavated area exceeds 300 m^2, although as can be seen not necessarily within an Iron Age context (Davis 2017, 347). Two notable exceptions are St Athan and Cwm George, Dinas Powys which may indicate a degree of centralised processing, at the local scale, although their absence may not be explained by utilitarian processes (*ibid.*).

Biglis to the east of Barry, excavated 1978-79 by GGAT, uncovered a late Iron Age/Romano-British farmstead (Parkhouse 1988, 3). The first phase comprised an unenclosed settlement at the end of the Iron Age, whose occupation subsequently ended by the latter part of the first century AD (*ibid.*). Environmental samples from the site fall within a Roman context, i.e. Phase 2, and is therefore not necessarily indicative of later prehistoric agricultural practices (*ibid.* 64). The presence of free-threshing club wheat, whose use was not widespread until the mediaeval period, also indicates that caution should be exercised when trying to infer late prehistoric agricultural practices from the available evidence here (*ibid.*).

With reference to the Levels, possible evidence for the presence of querns has been found at Peterstone, in a Beaker context, and Redwick, Newport (Bell *et al.* 2013, 92 177 and 218). The querns would have been in an area not ideally suited to the production of grain could indicate ritual deposition (*ibid.*). Furthermore, a saddle quern was retrieved from Collister Pill, Undy (*ibid*., 301 and 2000, 348 – 51). Although not dateable, the proximity, at West Pill, of a barbed-and-tanged arrowhead is possibly indicative of an eroded Bronze Age site in the vicinity (*ibid.*). Of a more certain provenance, at the Outpost Llanmelin, was a rotary quern fragment, 'weathered out' of an enabling step to ensure safe passage for the excavators, infill from this ditch included pottery from the Middle to Late Iron Age (Jones 2023, 8 and 10, and Hedge 2023, 63).

Grain pits started to appear about 800 BC and were one of several features that indicate social change was underway (Haselgrove and Pope 2007, 4; Needham 2007, 55; and Brown 2009, 4). Grain storage pits are not characteristic of later prehistoric settlements in Wales and their absence, by some, would also appear to be considered indicative of the presumed pastorally based economy in southeast Wales (Davies and Lynch 2000, 174; Davis 2017, 346 – 7; and Mytum 2018). The geology of southeast Wales is, however, very different from that of the chalk of Hampshire and, therefore, is unsuitable for such storage pits. Chalk is free draining, and Hampshire relatively 'dry' when compared with southeast Wales; therefore, the higher levels of rainfall combined with an unsuitable substrate probably precluded its adoption as a storage solution here. An alternative solution for the storage of grain could be that it was stored in rectilinear four-post structures above ground (*ibid.*). Four-post structures are present in a significant number of farmsteads, which could indicate a degree of autonomous/dispersed storage throughout Wales (Mytum 2018). The dangers of employing theories based in other regions is evident by this brief analysis.

In the borders, four-post structures are common features in hillforts. Such structures would indicate that farmsteads produced surpluses, at least in certain parts of the British Isles, and that this surplus may have been centrally stored in hillforts. Within the Vale, such structures are associated with a number of sites; including three at Caerau hillfort and four at RAF St Athan (Barber *et al.* 2006, 57; Wessex Archaeology 2013, 7; Davis and Sharples 2014, 11 and 37, and 2016, 36 and 48; and Davis 2017, 347). The presence of four posters at RAF St Athan demonstrates that hillforts in southeast Wales were not the only places of storage. An oat and unidentified cereal grain, obtained from a post-pit of one of the four-post structures, at RAF St Athan, were radiocarbon dated to 400 – 200 cal BC (Warman 2006, 90).

Conclusion

Differences of opinion over what constitutes a small hillfort, which in Cunliffe's view constitutes strongly defended homestead, is a significant issue. However, the Atlas' definition is utilised in this thesis. The subtle interplay of settlements and hillforts will be nuanced and explored further in subsequent chapters. Furthermore, the assertion of

Audouze and Büchsenschütz (1991, 178) that dispersed settlements are the norm for Britain will be tested.

Both hillforts and roundhouses appear to avoid areas of land at relatively high altitudes. As Brown (2019, 33) observed, most (89%) of the hillforts in England and Wales do not exceed 300 m in altitude, which therefore appears to be one of the critical locational factors. Presumably, such selection relates to the more hospitable conditions found at lower altitudes, which also have a greater carrying capacity. This aversion to such areas is particularly evident in the Cairngorms NP, Scotland. It is further emphasised by roundhouses and hillforts on the periphery of this arctic-alpine environment.

Generally, roundhouses follow the distribution of hillforts, although there are some exceptions. These exceptions include a broad strip through the Kent Downs to the Weald and Salisbury Plains, which then moves northwards up to the Severn Estuary. Hillforts dominate this area and correspond with the southern extent of Cunliffe's (2005, 74 and 2013, 304) hillfort dominated zone (see Figures 11 and 14). It has been asserted that the widespread nature and number of hillforts are fundamental to our understanding of later prehistoric life. However, given the fundamental importance of the home in a person's life, dwellings are perhaps even more important, at least at the familial level. Furthermore, the absence of hillforts from parts of the British Isles, such as parts of the east of England, indicated that they were not such an essential feature of later prehistory, at least for these areas. In contrast, a home would always be required for people living within an area.

Cunliffe's (2013, 304) model has a zone of strongly 'strongly defended homesteads' up Britain's entire 'Celtic' western margins. This language is unhelpful in perpetuating a narrative of violence that appears Anglo-centric in that one has to go to the east of the hillfort zone to enter the zone of villages and open settlements (i.e. civilised?). It is time that less disparaging narratives were developed when discussing the settlement patterns of later prehistory. Rather than jump at such perceived truths, one should look to the evidence for an explanation of these differences. After all, housing in pre-industrial Britain was more vernacular architecturally speaking, and it took until the advent of the Industrial Revolution for a more homogenous approach to materials and design to be adopted.

The ephemeral nature of later prehistoric farming in southeast Wales, where the land has been subject to intensive modern farming practices, has left little evidence regarding field patterns. Open field systems would leave very little evidence, and grazing could have been practised on a commons basis in areas only suitable for transhumance grazing. Further to this, clearance cairns are, however, present in the upland areas of the region. The paucity of bone assemblages for the region and levels of differential preservation mean that it is difficult to determine any changes and regional differences in animal husbandry.

Agricultural practices in later prehistory in southeast Wales seem to preclude the necessity of having field boundaries, as there are very few within the region. Some have presumed that this absence of field boundaries indicates the prevalence of pastoralism within the region. It should be borne in mind that one does not necessitate the other, as evidenced by the open field systems present before the 'Agricultural Revolution.' The presence of good agricultural land in the Vale of Glamorgan and parts of Monmouthshire today would imply that much of it would have been suitable for arable farming in later prehistory. The presence of grain processing equipment within the region would also indicate its production here. To this end, querns "…are not uncommon…" and four posters, assumed to be for grain storage, present in hillforts within the region; yet Cunliffe (2005, 299) espouses that the absence of fields as indicative that arable farming "…may have been subservient…" Furthermore, to counter this assertion, there is evidence of cereal production in several locations in south Wales during later prehistory (Caseldine 2018).

It is not to say that pastoralism did not feature in the agrarian economy of later prehistoric southeast Wales and in places such as upland areas or the Levels, pastoralism may have been pre-eminent. Transhumance may have been practised in the Levels where the marshy ground would have acted as a natural water meadow in the Spring. The Levels would have been inaccessible in the winter, as the ground would have been waterlogged or frozen. Rectangular buildings at Goldcliff, Redwick and Cold Harbour in the Gwent Levels that had been subdivided indicate stalls for housing cattle, demonstrating a level of stock control necessary for dairying (Bell *et al.* 2013, 156). The bone assemblage and hoof prints also indicate the importance of cattle at Goldcliff, which reflects the practises elsewhere in the Levels.

Upland areas may also have been utilised for grazing later in the agricultural year than the Levels. To this end, a group of settlement sites and clearance cairns/cairnfields are concentrated on the Group 5 cluster centred upon Llwyn-onn. The Taff Fawr and Tarell valleys facilitate a natural route between Brecon and this area and may have provided a route to access summer grazing in this upland. This cluster appears relatively discrete despite the surrounding topography being similar, the concentration of sites here potentially indicating the termination of a route or it petered out as one approaches the summer grazing.

Chapter 6: Methodology

Introduction

The opening premise is that whilst this chapter allows one to understand the methodology used; one must consider why the various techniques have been utilised in the first place and their role in providing insights into later prehistoric life (Gillings *et al.* 2020, 1). To understand the lives and society of such people more fully one must look to their settlements and monuments from a spatial perspective.

This chapter details the methodological approach adopted by this thesis in interpreting the available data and for the subsequent statistical testing that was undertaken in drawing any conclusions based on the available evidence. The results are both repeatable and verifiable, allowing for the corroboration of the findings. As McKeague *et al.* (2017, 3) observe, "Data should not be constrained and straight-jacketed within project reports but liberated and placed within the wider landscape of a digital map." As such, it is hoped that the data produced here will eventually become available online for others to use and interpret, possibly even coming to different conclusions from the author. Creating such a dataset will allow others to apply differing methodologies and expand the dataset, possibly into other areas, such as that to the north of the coalfield or east of the Wye.

Data availability has expanded significantly in the last decade, and the hegemony of ESRI's ArcGIS is now being challenged by open-source software, such as QGIS (formerly known as Quantum Geographic Information System). By utilising these alternatives to ArcGIS, equally valid approaches can come to the fore, and the open nature of the source code allows for the scrutiny of the QGIS' code base, resulting in the regular removal of bugs.

For Seaman and Thomas (2020, 552) the first stage was the generation of topographic datasets for southeast Wales applying 'retrogressive landscape analysis' (*ibid*.). By applying landscape stratigraphy subsequent elements of landscape change, such as the rail network, can be taken account of (Rippon, 2004, 83; and Seaman and Thomas 2020, 552). To an extent the OS DTM does this by removing protruding features, including trees and buildings, that extend above the ground's surface (OS 2017, 5). As Seaman and Thomas (2020, 552) observe in relation to Cardiff, but which is applicable to all urban areas within the region, the urban and industrial development here is simply too extensive to perform retrogressive landscape analysis.

Stage 1: Introduction to the data

A GIS based landscape mapping exercise, which utilised a variety of evidential sources such as the regional HER and the National Monuments Record (NMR), should address the issue of later prehistoric landscape organisation, at least in part. GIS can typically be applied to landscape archaeology, spatial modelling of prehistoric societies, excavation, archaeological resource management (Conolly and Lake 2006, 33 – 50) and, as an encompassing subcategory, predictive modelling. Predictive modelling may ultimately allow for the testing of any hypotheses, by excavation or detailed survey, of the potential sites identified and has been utilised as such by archaeologists (Conolly and Lake 2006, 34 – 5 and Murray 2016, 23).

Databases, such as the HER, do not identify relational and temporal complexities of spatially extensive archaeological evidence (Gwilt *et al.* 2003, 2). Therefore, it would be necessary to relate the evidence to its geography to get meaningful results, but a more in-corporative approach that includes a broader interpretative schema is desirable (Ch'ng *et al.* 2011, 52). Point data may be helpful in distribution maps, but at larger scales, its shortcomings rapidly become apparent (McKeague *et al.* 2017, 2). Archaeological sites, particularly the larger ones, where spatial information is paramount cannot be usefully described without reference to their spatial parameters, such as morphology and topology (Conolly and Lake 2006, 12 – 4). This thesis, in part at least, aimed to address this by drawing on a broad range of topographical features, such as aspect, proximity to water, altitude and the geological data for the sites. Additionally, viewshed analysis, buffering, network analysis and pattern analysis were undertaken in order to determine possible solutions to the research questions posed in Chapter 1:

- What were the locational factors, such as proximity to water, underlying geology and topography, in the study area?

- How was the landscape structured/organised within the geographical context of southeast Wales during later prehistory?
- What functions did hillforts perform in the region?

The ability to import polygons into Google Earth Pro allowed for viewing modern contextual environmental conditions in relation to viewsheds and least cost paths. A scheduled monument's full report can then be accessed within Google Earth Pro by clicking on the polygon and the associated url, i.e., Uniform Resource Locator, in the site's profile details.

Aerial surveys from the 1950s have shown that simplified models of Iron Age settlement patterns are unrealistic and that the situation is far more complex than was initially appreciated (Wigley 2000, 2). Aerial photographic data is now readily accessible with the advent of Google Earth, and photographs often encompass several years. This temporal range gives greater scope for the optimum climatic conditions to be captured and reveal the presence of crop/parch marks when the photographs were taken. To this end, it would aid in the identification of settlement types and field patterns, such as lynchets, if they are present in the limestone areas of a southeast Wales. However, on a cautionary note, the limited extent of arable agricultural practices in Gwent may limit the effectiveness of this particular avenue of investigation (Howell and Pollard 2004, 140).

Data Sources

The principle datasets utilised were, see Websites for web addresses:

1. HER/NMR (utilising Archwilio and Coflein, respectively)- relating to identified Bronze Age and Iron Age sites. The unifying Historic Wales Portal was also utilised.
2. Atlas of Hillforts of Britain and Ireland, an online database.
3. Geological data (solid and superficial) from the Geological Survey of Great Britain (England and Wales).
4. UK Soil Observatory.
5. Ordnance Survey data for the evaluation of a settlements' location within the landscape, including rivers.

6. Archaeology in Wales, Archaeology in the Severn Estuary and publications by GGA.
7. Google Earth Pro.
8. DTM 2 m resolution from Lle Geo-Portal obtained from Natural Resources Wales.

As and when additional information was required from the site's description on the HER, the relevant records were obtained from Archwilio, the online HER for Wales. This was necessary as only a summary was provided directly by GGA from the HER. To allow for the cross-referencing of data, a sites HER and/or NMR reference number will be quoted, where necessary, to provide further clarity to what site is being referred to. Several sites have similar names that relate to different time periods or geographical locations.

The GIS data was obtained in various formats and saved as shape files or TIFFs where required, although the data supplied by Edina came in the following formats:

- OS MasterMap Water Network as GML3 at 1:2500 (Version July 2018- Downloaded 11th September 2018).
- Boundary-Line supplied by the OS as shape files at 1:10000 (Version April 2018- Downloaded 11th September 2018).
- OS Terrain 5 Contours as shape files at 1:10000 (Version April 2018- Downloaded 10th February 2018).
- OS Terrain 5 DTM as ASC at 1:10000 (Version April 2018- Downloaded 11th September 2018).
- DiGMapGB-50 supplied by the BGS as shape files at 1:50000 (Version 2016- Downloaded 24th November 2017).
- Soil Parent Material Model by the BGS as shape files at 1:50000 (Version 2011- Downloaded 19th December 2017).

The above data was available as tiles, which were uploaded into QGIS, creating a mosaicked image, which was then merged to create a single file. The resultant images were then clipped, using a mask layer that had been created of southeast Wales, to produce an image that just related to the region.

In addition to the above, evidence was utilised from excavation reports and grey literature where available in order to further develop a narrative and close any gaps in the HER's dataset. The need to do this is clearly demonstrated by Bell *et al.* (294) in the 2013 publication *'The Bronze Age in the Severn Estuary'* where a Bronze Age field system is shown for Gray Hill, Monmouthshire. At the time of writing, this was not recorded on the HER. Furthermore, for Gwent, it was noted by Hamilton (2004, 85) that not all information was published or submitted to the then SMR by the various local societies. Active local societies or researchers, undertaking fieldwork, could skew the data present on the HER though, should it be submitted, by concentrating on the group's interests. However, this shortcoming noted by Hamilton (2004, 84 – 5) has probably been addressed, at least in part, by groups such as Monmouth Archaeology now undertaking commercial archaeological work and being required by planning condition to submit the resultant reports to GGA. *Technical Advice Note 24: The Historic Environment* also prescribes this approach. The planning regime potentially skews the data in favour of areas where development has or is going to take place and where it has been deemed appropriate to impose such a condition. Archaeologically Sensitive Areas, drawn up by local planning authorities, also increase the likelihood of the imposition of such conditions.

Data Cleansing

HER data had to be 'cleansed' by first aligning the data to the appropriate cell in the database. This was necessary as the data had either been entered incorrectly, on occasion, or had become transposed for some unknown reason, in that the entry was present in the wrong column of the database. Additionally: duplicate entries, such as at Cwm Cadlan; erroneous references to natural features; sites outside the area; and sites that were not considered by GGA to be relevant, had to be removed, which inevitably resulted in a reduction in size of the dataset. However, what resulted more accurately reflects the position on the ground. Finally, a standardised approach to the data had to be applied as many entries showed a diversity of approaches when using capital or lowercase letters, for example. This would potentially complicate any data analyses and produce confusing legends associated with the resultant GIS produced maps. A table of the resultant cleansed data is available in Appendices E to I.

The descriptor, under the heading 'Type', was often helpful to give a general reflection of the site in question, for example in the case of hillforts. However, in the case of

‘Broad Class’, it was considered inappropriate for this thesis to adopt it wholesale; for the following reason, the descriptor Domestic/Defended was considered by virtue that it referenced both defended and domestic was loaded. This diversity of approach is best demonstrated with the terms used to describe roundhouses, such as hut, hut circle, hut platform and round house. Therefore, the term roundhouse was adopted to cover all eventualities where the term referred to a dwelling.

Factors influencing known settlement distributions

'Few Late Bronze Age settlement sites have been identified; examination of known Iron Age sites could aid this' (Review of the Research Framework for the Archaeology of Wales Responses to Research Framework Questions 2004, 1). However, this presumption is based on the continuity of settlement in a given location. It could be a dangerous assumption for more marginal areas without the appropriate testing of this hypothesis via excavation. Some rural settlements were occupied in the Iron Age and Romano-British periods (Caseldine 1990, 67). However, this may make their separation (in terms of this study) undesirable, as it could skew the resultant data.

Furthermore, four factors influence the distribution of known sites: the original distribution; archaeological investigation focussed on specific locales (i.e. Severn Estuary); geomorphological processes, such as coastal erosion and fluvial deposition; and the state of preservation (Bell *et al.* 2013, 335). A degree of interchangeability is present within the last three categories though. Concerning the first factor, the Severn Estuary Levels Research Committee has focused much on coastal areas, but this is in stark contrast to the inland areas of Gwent, as observed by a number of authors. One has to be aware of this geographical bias, as it could skew the findings significantly in any regional study.

Site Assessment

Over the passage of several millennia, the impact of agriculture, forestry and urbanisation may make this a challenging exercise. To experience the unique qualities of a site’s location directly is preferable, via a site visit, as it allows an individual to relate to those qualities directly, albeit through modern eyes. However, this was impossible due to the sheer volume of sites, although a number were visited.

Whilst it would have been desirable to categorise the sites identified (Waddington 2013, 119 and Ghey *et al.* 2007, section 1.2) to the following set criteria:

1. Modern excavation (good excavation techniques and recording)
2. Modern excavation (poor data/survival)
3. Pre-1960 excavation (usable data)
4. Pre-1960 excavation (limited data)
5. Geophysical survey
6. Field walking
7. Assessment based on area and form/morphology

to ensure that broadly comparable data standards could be drawn upon. It was not possible in this study due to the large-scale absence of modern excavation. As such, there was inevitably a significant reliance on a site's form for inferring its use, such as the features of a roundhouse.

Further details were obtained by analysing the correlation of sites, against various geographical parameters, as detailed below available as GIS layers from a number of sources; in addition to the primary HER data to assist in classification comparison. These parameters included:

1. Superficial geology and soils.
2. Proximity to water.
3. Topography of the site (hilltop, promontory, valley bottom, amongst others).
4. Altitude.
5. Proximity, intervisibility and accessibility to neighbouring settlements.
6. Potential to exploit and manage differing environments for resources by analysing the apparent intensity of occupation.
7. Proximity of earlier monuments.
8. Visual impact of the site.

Unfortunately, many of the sites recorded in the HER, for any given period, were classified solely on the basis of their morphology. For the Bronze Age and Iron Age, this can cause significant chronological uncertainties, particularly for monument types that can relate to a preceding period, such as Iron Age hillforts. This in turn excludes correlating the adoption of a given monument type in response to climatic events for example, thus precluding such a hypothesis from being evaluated within this thesis.

The geological data was sourced from the British Geological Survey (BGS) at 1:50000 which in turn was derived from the 1:10000, though at this scale the digital geographical coverage is less extensive and therefore the 1:50000 scale had to be utilised. Topographical layers were not included with the DiGiMapGB geological data, provided by the BGS, thus leaving the user dependent on current OS data. The OS topographical base may be a partial fit for the geological data, as it is more current regarding the techniques employed and the data utilised in its construction. Caution must be exercised at the 1: 50000 scale as 1 mm equates to 50 m on the ground. Coordinates provided by GGA were generally eight figure, but some had been converted from six figure with the insertion of a zero at the end. However, with hillforts, polygons were created for the sites, providing more accurate locational information than a point inevitably could.

The data provided by the Ordnance Survey, sourced from Digimap, was at 1:10000, the largest scale supplied, except for the Water Network, which was at 1:2500. This provided sufficient accuracy, as 1 mm equates to 10 m on the ground, for most sites that were the subject of this thesis. With the data for water, the accuracy is even greater still at 2.5 m on the ground, though watercourses can move over time; particularly in lowland areas where they may be subject to meandering. OS Terrain 5 DTM is described as "…a mid-resolution DTM, designed to be interoperable with large-scale data…" (OS 2017, 5), such as the above Water Network Data. The data was extracted by the OS from 'large scale aerial imagery', which has an accuracy in excess of 2 m root-mean-square error/deviation (OS 2021). Murray's (2016, 32) thesis was reliant on the OS Land-Form Profile DTM, now an archived dataset, which consisted of 10 m grid cells, with the heights given at the intersections, when researching the topology of hillfort locations, albeit lidar data was also utilised. As such, the OS Terrain 5 DTM should be sufficient for the purposes of this thesis. The coordinate reference system used, which therefore acted as the datum, was OSGB36 (Ordnance Survey Great Britain 1936/EPSG:27700), as this was the format that the available data was produced in by both the Ordnance Survey and British Geological Survey.

Lidar data, obtained from airborne laser scanning (ALS), as a digital terrain model (DTM) from Lle, a geo-portal for Wales, referenced to the British National Grid, which has subsequently been replaced by DataMapWales. The data obtained has a vertical accuracy of ±0.05 m for more recent surveys to a maximum departure of ±0.15 m with a horizontal accuracy of ±0.40 m (NRW, 2018, 2). Lidar data was utilised, where necessary, to augment the Ordnance Survey data.

A DTM, obtained from Lidar data at a 2 m resolution, was used to capture the polygons for hillforts and promontory forts. At a 0.25 m resolution hillforts can be seen in greater detail when compared to a standard aerial photograph, particularly if woodland is present. However, at this resolution, data is only available within the study area for the eastern Gwent Levels, Llanmelin Hillfort and an area immediately west of St Fagans. The Ancient Cwmbran and the Cistercians Project have utilised data at the 0.50 m resolution to good effect, but in reality the only widespread data sets available were at the 1 m and 2 m resolutions. The 2 m resolution has near universal coverage of the region, whilst that at the 1 m level is absent for the northeast of the region to the north of Abergavenny and Monmouth.

Most polygons obtained to calculate areas and visibility were derived from the Lle 2 m DTM, as that from the OS DTM was at a 5 m resolution, and details could not be discerned in some cases. A cascade principle was adopted with the highest quality data was utilised first where possible:

1. Lle 2 m DTM
2. 1:10000 OS DTM
3. Google Earth Pro
4. England & Wales Ordnance Survey Hills 1892-1908 (Provided by David Rumsey Map Collection, accessed via Google Earth Pro).

Cross-referencing between datasets was sometimes required to clarify the extent of the areas required.

Stage 2: The Utilisation of Geographical Information Systems.

Why open source software?

Whilst the proprietary ArcGIS software from Esri is commonly used in the higher education sector, it has been identified that there is a need to recognise other available packages (Green 2011, 53). As such, this research aimed to utilise non-proprietary open source software. With open source software the source code is freely available, and can be altered and redistributed if wanted. Generally speaking, such software is more widely used in mainland Europe by higher education institutions than in Wales or the U.K. Universities on the continent are actively involved in the development of GIS packages, such as SAGA (System for Automated Geoscientific Analyses) under development at the Institute of Geography, Section for Physical Geography, Klimacampus and University of Hamburg, Germany. ‘Free software’ not only provides a saving in terms of the financial cost of the initial outlay for the software, but there are also many online learning resources available; such as tutorials and support forums, most of which are also free (Orengo 2015, 67).

GIS modelling, utilising the software packages QGIS (formerly known as 'Quantum GIS') with GRASS (Geographic Resources Analysis Support System) and SAGA plugins was employed to interpret the available data relating to settlement patterns and their hinterlands. The ability to use SAGA and GRASS, within QGIS, significantly expands the capabilities of QGIS. It also minimised the learning curve for these software packages and, for example, although GRASS is renowned for its capabilities, its graphical user interface is somewhat quirky. Proprietary software also limits the user to modules available for that software. Public participation with its associated online communities, built up around the respective open source software packages, mean that they are sensitive to user requirements, which then results into their incorporation within the GIS package in question (*ibis.* 68). As a result, QGIS is responsive to user needs and is under constant development, with point releases each month. To this end, version 3 series was released in March 2018 with significant revisions to the code and a shift to reliance on the latest version of Python, a computer programming language. Increased functionality, such as inbuilt CAD style digitising tools, were also included.

This can also be seen in GRASS GIS, which utilised Knight's move in generating least cost paths, whilst most GIS software, including ArcGIS, was reliant on the less accurate Queen's move (Herzog 2014) at least in 2014.

Plugins allow the user to use algorithms provided by the plugin to be run under QGIS, and algorithms from external applications can also be utilised within the toolbox. QGIS is very versatile due to its ability to read and edit such a wide range of data formats, for example it supports over 70 vector formats. The many online tutorials and wide support network, with the likes of Stack Exchange (a question and answer website covering a range of fields), make QGIS exceptionally user-friendly for the novice GIS user. In the event of a shortcoming being identified there are c. 865 plugins that increase the basic functionality, which should ensure a solution is found.

Unfortunately the majority of GIS users are, at least initially, trained in the use of proprietary products, which can leave the user resistant to change, as there will be a learning curve associated with the adoption of new software (Orengo 2015, 69). Orengo (2015, 69) is critical that the current teaching practises relating to GIS are,

> …still based on the repetition of practical processes directed at solving specific case-studies and not on the learning of the concepts, functions, applications and basic structure of GIS, which renders the adaption to new GIS software difficult.

By adopting a more flexible and questioning approach that does not focus, therefore becoming constrained by, on the case solving approach leads to a more complete understanding of both GIS and the tools available to the researcher.

GIS and the statistical techniques employed

By utilising various GIS techniques, it was possible to gain insights into how the later prehistoric landscape of southeast Wales may have been structured and the role of hillforts in the region. The region's geography would have had a significant impact on those people who occupied it, in late prehistory, from how the region could be farmed, sources of water and site prominence for example. Altitude at one end of the scale would have limited the ability to graze the high plateau to the summer months and, at the other end, spring grazing of the Levels due to flooding during the winter. This flooding would provide a natural water meadow in the spring, furnishing much needed early grazing.

Water is a crucial resource for people, that is often ignored in the developed world; its proximity would have been a prime factor in the consideration of a settlement's location, in that it is needed on a daily basis to drink, but conversely sites subject to periodic flooding would be avoided. Topography and river systems would also have had a profound influence on how people would have moved through this landscape. Rivers could be barriers to the movement of people and suitable fording points vital in facilitating the movement of people. Alternatively, a river could act as a highway to the interior of the region, but given the high tidal range, several metres, in their southern reaches may have been treacherous to use.

The uses of the wider landscape may not all have been of a functionalist nature and instead relate to elements of a collective belief system. Furthermore, political statements of territoriality may also have been a factor. Earlier monuments may have been utilised to give a temporal and divine credibility to such claims, but they may have also acted as waymarks to direct the movement of people, yet still affirming a sense of identity. In a world where belief systems may have formed an integral part of a person's everyday life, it may be difficult to disentangle the secular from the divine. In any event, to try to do so may give an inaccurate portrayal of later prehistoric life.

A synthesis of the available geographical data, which is interdisciplinary, is required to elucidate a greater understanding of settlement patterns for later prehistory in southeast Wales. It was intended that this thesis not concentrate on physical and environmental data to the exclusion of the socio-cultural landscape, but seek a synthesis of the two. As observed by Van Hove and Rajala (2004), earlier archaeological work that utilised GIS focussed on environmentally deterministic parameters and neglected the temporal element. Unfortunately, it was impossible to address the latter issue due to an absence of absolutely dated sites. Other issues were addressed as they became apparent, both in terms of the data and the modelling approaches, which O'Driscoll (2016, 429) suggests are often flagged but subsequently ignored. However, it was this author's approach that any such occurrence should be highlighted rather than dismissed.

In utilising statistical methods, Dungworth (1997) cites Leese's (1981) assertion that 'pattern searching' methods are undesirable when compared with 'hypothesis testing' methods, as they tend to rely on non-archaeological parameters; although this need not be a problem. It was therefore intended, wherever possible, that archaeological/geographical data parameters would be utilised. In any event, such apparent clustering may be worthy of investigation in its own right, as certain geographical parameters may not have been previously considered. A multivariate approach was therefore appropriate here by utilising a number of GIS techniques and applying 'hypothesis testing' to the results. In order to understand how a later prehistoric person may have experienced their environment, it was determined that it was appropriate to utilise visibility and movement analysis, as one cannot separate the two in terms of a person's perceptual experience of their surroundings (Lock, Kormann and Pouncett 2014, 23).

Buffering

Buffering or proximity analysis, in its most basic form is a measure of the distance from a geographical feature, such as a watercourse (thus producing a corridor), and/or archaeological feature for a prescribed distance. Buffering can be set at multiple distances for the same feature, which then allows for a comparison to be drawn between the distances thus further indicating the significance of the feature to, in this case, occupants of a site. For the terms of this thesis, it was determined that a watercourse would lend itself to buffering given the presumptions often made about a site's proximity to water by authors such as Cunliffe (2002, 293).

Though circular site catchments have now been largely superseded by least-cost path analysis, they still provide a simple and effective means of analysing proximity over a relatively short distance to a given parameter (Herzog 2014a). Buffering is therefore useful in testing for a possible link between a site and a given feature, though not necessarily a causal one. The single most important natural feature necessary for human occupation would be a reliable water supply. Harding (2012, 17), observes that few professional archaeologists consider water supply when discussing hillforts, although only a limited number have springs present.

As such, the principal natural feature that was analysed in this way were watercourses and the proximity of settlements to them. Proximity to a reasonable water supply is one of the main determinants for choosing a given location to occupy. As observed by Burroughs (2007, 250), the Late Bronze Age climate, in northern Europe, was wetter than present. This being the case, water was more readily available in the form of additional springs and streams due to a higher water table whose ephemeral nature, relatively speaking, has led to their subsequent disappearance (Timmins 2011, 159). Reliance on watercourses could be overcome though, in suitable locations, by the sinking of a well. Aside for the importance of water to life, watery places were utilised in the Bronze Age for ritual purposes involving the deposition of votive offerings in the water. As Pryor (2004, 182) states "It was [water] of fundamental practical and ideological significance in ancient Europe, and nowhere more so than in the British Isles." The significance of such springs, as in the case of the Virtuous Well in Trellech, Monmouthshire, continues up to the present; although this is not intended to imply that such springs have been used continuously since the Bronze Age.

Statistical Significance

Due to its simple data requirements, the statistical tool chosen was the chi-square test ((x^2) Wheeler *et al.* 2004, 164). It is also versatile, making it ideal for testing the significance of altitude, soil/geological type and aspect in determining requisite locational factors (Conolly and Lake 2006, 123). The null hypothesis is that there is no association between a given factor, such as an aspect, whilst the alternative hypothesis indicates an association. Conolly and Lake (2006, 123 and 125) observe that chi-square is suitable when comparing sites on differing geologies and soils. However, it can be used for any site-specific geographical parameters. Chi-square tests 'goodness of fit' between an observed set of categorical frequencies and a theoretical set. It must be borne in mind that chi-square does not indicate the strength of a correlation; it is just an indication that there is a statistical probability of a link irrespective of whether it is a weak or strong correlation (Shennan 1988, 74). It is used to identify if a particular variable is uniformly distributed, which makes it particularly useful for analysing geographical data. Chi-square can be utilised to analyse distributions against their associated environmental factors or categories and then compared with the expected number (Kvamme 1997, 47). If a category were to account for 10% of an area, should the null hypothesis be correct, 10% should be categorised by this attribute (*ibid.*). Essentially, this measures the difference between actual and expected observations. The chi-square value increases accordingly as the difference between observed and expected frequencies increases.

The chi-square formula is:

$$x^2 = \sum_{i=1}^{n} \left[\frac{(O_i - E_i)^2}{E_i} \right]$$

Where:

x = Chi-square statistical.

O_i = Observed frequencies.

E_i = Expected frequencies under $H0$ of no difference

Σ = Summation.

For calculating the degrees of freedom:

$$v = (r-1)\times(k-1)$$

Where: v = Degrees of freedom.

k = Number of columns or number of categories used.

r = Number of rows.

(Wheeler *et al.* 2004, 164 and Shennan 1988, 67)

There are two possible hypotheses for the data set, as stated below:

Null hypothesis- There is no association between the category (insert the relevant category such as slope, aspect, soil and geology, for example) and the location of sites in the study area.

Alternative hypothesis- There is an association between the category (insert the relevant category such as slope, aspect, soil and geology, for example) and the location of sites in the study area beyond that which might be expected by random variation.

The expected number is determined by the proportion of the study area occupied by a given category. As the difference between the expected and observed numbers of sites increases, evidence is therefore accrued that the alternative hypothesis is correct (Kvamme 1997, 47). When employed, it should be able to test the assertions made by researchers such as Makepeace (2006), where certain factors, such as the presence of water, are said to be associated with sites.

Wheeler *et al.* (2004, 166) observes that three limitations should be considered when utilising the chi-square statistic:

1. A test prerequisite is that if more than 80% of the categories contain less than five expected occurrences, the data should be rearranged into fewer groups. If this is done, it must be noted that significant trends may become subsumed within the smaller group of measured frequencies.
2. X^2 can only utilise absolute data, so percentages must not be used. The observed frequencies are entered into a contingency table (Conolly and Lake 2006, 123).
3. "The null hypothesis should not yield any expected frequencies of zero."

Significance levels are usually set at 0.05 or 0.01 (Wheeler *et al.* 2004, 137), although 0.05 is commonly used by convention (Conolly and Lake 2006, 123 and 125, and Aldenderfer 2005, 514). At these levels, chance should only account for 5% or 1% of the outcomes, with a confidence level of 95% and 99%, respectively, at these levels the results would be considered statistically significant. All critical values were set to the lowest available significance level. At the 0.05 level, one would have just a 5% risk of rejecting the null hypothesis wrongly, known as a Type 1 error (Conolly and Lake 2006, 123 and 125; and Aldenderfer 2005, 515). As a word of caution, if the value falls below the 0.02 significance level, the hypothesis would appear not to address all the facts, although most statisticians would utilise the 0.01 threshold (Aldenderfer 2005, 514 and 516).

The rejection of the null hypothesis does not, by default, mean that the alternative hypothesis is correct; this is a matter of interpretation by the researcher, as alternative scenarios may account for the rejection of the null hypothesis (Aldenderfer 2005, 514). As such, it was determined that a more discursive review of the decision in non-statistical terms was required when analysing the results (*ibid.*). By adopting this approach, it is also hoped that this paper will address some concerns raised by archaeologists from their respective schools of thought vis-à-vis the scientific and humanistic approaches to interpreting archaeological data (Kristiansen 2019, 1). At this juncture of the analysis, Kristiansen (2019, 2 – 3) observes that theories are produced to determine the environmental thresholds that may have influenced economic and social relationships. Ultimately, one must remain objective when applying a more discursive approach and qualify the reason for any departure from that provided by the various techniques used.

Pattern Analysis

Pattern analysis was employed to represent the location of sites, describe their geographical attributes, such as soil type preference or proximity to water, and determine their spatial characteristics. As such, point distribution is a helpful tool "….for describing, interpreting and explaining the spatial characteristics of these phenomena" (Conolly and Lake 2006, 162). At different scales, patterns may become apparent, and as such, it may be necessary to adjust the area to encompass some whilst excluding others. The pattern analysis techniques employed were nearest neighbour and k-means.

Despite the reservations of some authors, such as Murray (2016, 8), concerning the use of models to identify clusters or groups of sites, they do have a role to play. Whilst Murray's (2016, 8) assertion, "The use of a model is not a realistic means of defining a territory, if territories did exist within the Iron Age they would not have been calculated through the use of models" is true; it does not, however, recognise the value of such an approach, in assisting in our understanding of later prehistoric settlement patterns. Identifying such groups or clusters, although it still rests upon the researcher to identify the appropriate causal factors, directs one to focus on specific areas. These factors may include proximity to water, the land carrying capacity or even the cultural aspects of a society.

At its most basic level, sites are described as random, regular or clustered distributions, but these categories usually need to be more clearly defined in practise. Conolly and

Lake (2006, 164) observed that nearest neighbour was primarily designed to determine patterns of first-order nearest neighbours; hence, the need to adjust the scale, where appropriate, to identify the optimum number of clusters. The test presumes that second-order associations only exist at the smallest scale (Bevan 2020,65). An adjustment in the scale must be contextually sensitive though, as such an adjustment can lead to a distribution changing from nucleated to dispersed or vice versa (*ibid.* 2006, 218). Although random distributions sometimes confirm the null hypothesis, this may not be the case, as environmental factors can elicit such a result (*ibid.*).

Nearest neighbour is conducted by measuring the distance (r) between a point and the closest point (*ibid.* 2020, 65). All the distances are then averaged to obtain the mean and standard deviation. The degree of randomness in the distribution (R) is the ratio between the distribution's observed and expected mean distances. If the mean distance is low, the dataset is highly clustered, whilst if the data has a random distribution, it is close to the median value. Should the dataset have an even distribution, the distance is greater. By standardising the resultant data, it ranges from zero (highly clustered) to 1.00 (random distribution) through to just over 2.00 (even distribution (Bevan 2020,65)). As Wheeler *et al.* (2004, 297) observed, locational forces are rarely random, but the extremes can contribute to an apparent random position. In a modern context, even distributions could indicate a planned settlement within a region. However, in a prehistoric context, it could point to the saturation of settlement sites or an area at its carrying capacity. The dataset must have more than 30 sites to obtain meaningful results.

Assumptions must be made that no sites have been omitted and all the sites are contemporaneous. Unfortunately, this cannot be guaranteed, but the data has been obtained from a contiguous dataset with a reasonably large base, which would assist in mitigating this unknown factor. The most significant shortcoming of this technique is that where potential nearest neighbour sites fall outside the geographical remit of the area in question, it could adversely affect the results by causing an overestimation of the mean distance. This over-estimation could fail to observe clustering present or to assign an even distribution to one that is random. Fortunately, a significant proportion of the study area was probably sparsely populated and, as such, is likely to have had a minimal impact.

The nearest neighbour technique infers an isotropic surface (Wheeler *et al.* 2004, 297; Hernández 2006; and Bevan and Conolly 2006, 218); although the majority of hillforts fall below 244 m OD, the region is not what one would describe as topographically or resource homogenous. A possible solution is to extend the technique to the second or third-nearest neighbour (Wheeler *et al.* 2004, 298). However, as nearest neighbour was designed for first order neighbours, extending the calculations beyond this level creates issues concerning statistical validation (Bevan and Conolly 2006, 219; Conolly and Lake 2006, 165; and Hodder and Orton 1976, 41). First order effects include soils, topography and proximity to resources, whist second order effects include expressions of territoriality (Crima 2020, 158).

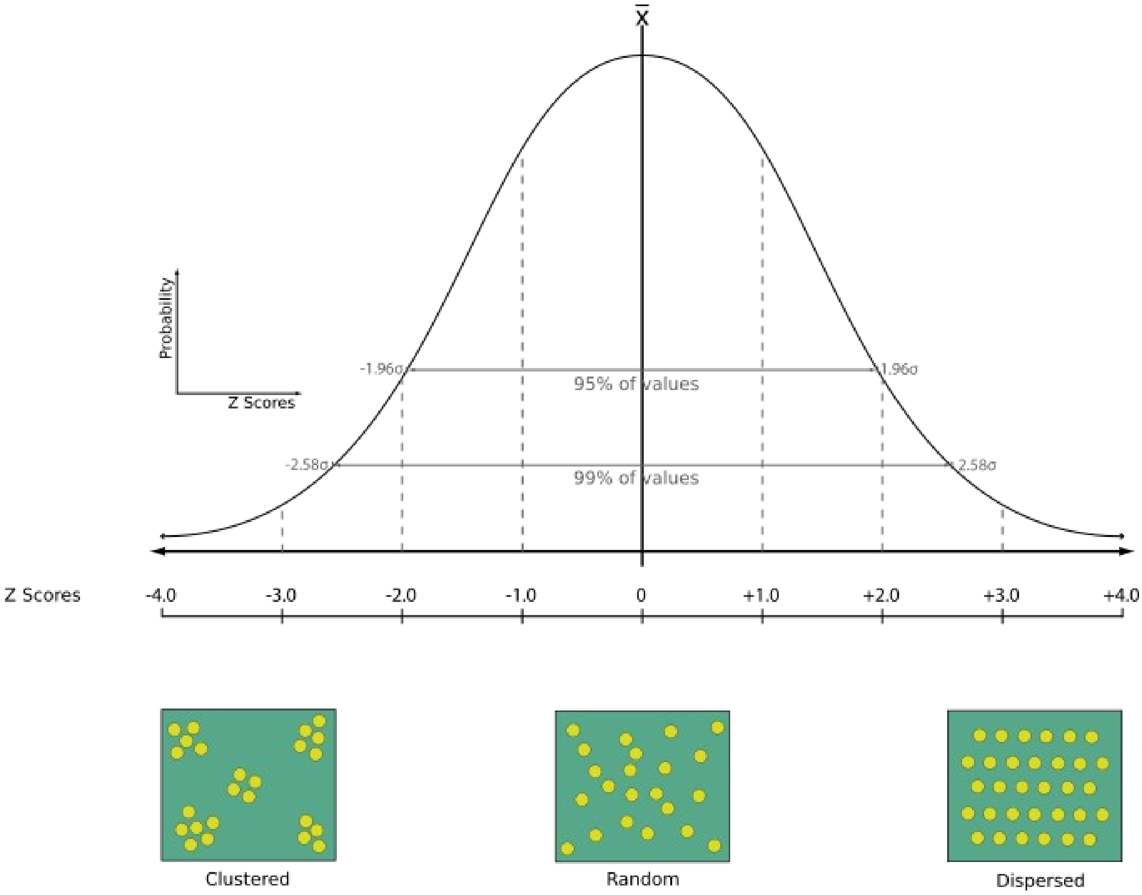
Hernández (2006) cites three shortcomings when utilising nearest neighbour analysis:

- Account needs to be made for the geography of the region.
- Subsidiary centres need to be considered.
- Boundaries between centres change over time and, as such, should be a consideration. Limiting the study to a distinct tribal area should mitigate against this, nevertheless.

Despite these issues, the technique useful as it is easy to convey the meaning of the results and is resilient to missing data (Bevan 2020,70 and Crema 2020, 158).

QGIS, when calculating the nearest neighbour index, also produces a Z-Score. This Z-Score (see Figure 15) can then be compared against the normal distribution, informing how the data is distributed. A Z-score is a measure of the departure from the mean value in standard deviations for a group of scores. Minus Z-Scores indicate clustering, which is unlikely to result from a spatially random process, whilst a high Z-Score indicates that the data is dispersed. Zero would indicate a random distribution (QGIS 2024).

Figure 15: Z-Score interpretation.



© QGIS 2024, Nearest neighbour analysis

K-means

Nearest neighbour is not particularly useful in determining multi-scalar detail, as it calculates first neighbour associations. To address this, a number of statistical techniques are available to those who try to identify clustering in archaeology. K-means, a non-hierarchical clustering algorithm, is the one generally used by archaeologists (Maddison and Schmidt 2020, 270). A potentially useful alternative is percolation analysis, which identifies clusters by their spatial separation whilst utilising Euclidean distance between points (*ibid.* 269). Given that percolation analysis, as utilised in archaeology, is a relatively speaking, a recent innovation; it has therefore not been comprehensively critiqued yet. As such, it was determined that k-means would be utilised.

The k-means statistic would therefore be helpful in identifying the potential optimum number of clusters for sites within the region. The k-means statistic partitions the data into a prescribed number of clusters by generating random ‘seeds’ around which the points are added (Conolly and Lake 2006, 170 – 1). A point closer to another cluster is reallocated, and the centre is re-calculated (*ibid.*). The statistic relies on random ‘seeding’ to precipitate the calculation, and, therefore, it can generate different optimum solutions, which can be a problem in terms of replicating results. The algorithm minimises the distance of points within a cluster with their centroid.

In archaeological terms, the advantage of k-means over other types of cluster analysis is that the clusters produced do not have to have a uniform size and simplicity. Unlike several other cluster analysis statistical techniques, k-means partitions the data, based on a specified cluster level, to produce clusters, whilst others adopt a hierarchical approach in that they produce groups of similar sites (*ibid.* 171). The ability to specify the level of clustering allows for comparing differing levels when selecting the optimum cluster level (*ibid.* 170). A flexible approach was taken to prescribe the number of clusters in a given algorithm iteration to determine the ‘best fit’.

Lancaster (2014, 6 and 33 – 7) identified clusters of settlement of a similar form to demonstrate a decentralised tribal structure for the Silures based on clan groupings. Davis (2017, 329) is critical of this premise due to the lack of consideration given to contemporaneity, variability of form and, additionally, the interrelationship of enclosed and open sites. Furthermore, there is little justification provided by Lancaster (2014, 33 – 7) for these perceived clan groupings, which seem arbitrary in some cases when considered within the context of southeast Wales. Applying k-means to the data allowed for testing Lancaster’s hypothesis and, therefore, the assertions' validity.

Network Analysis

Network analysis assists in studying the likelihood of communication between sites, described as nodes, for exchanging goods, ideas, coordinating religious festivals and markets, for example, or a potential route to a water supply. As Brughmans and Peeples (2020, 273) succinctly put it, “A network is a formal representation of the structure of relations among a set of entities of interest”. These paths also indicate the level of cohesion experienced in the region during later prehistory, as opposed to the level of isolation considered by many authors. After all, human beings are social animals with an innate need to interact with one another and the wider community rather than existing as isolated units. There are several models available to researchers including visibility networks, access analyses and spatial cultural networks each suited to a given approach (*ibid.* 276). Furthermore, viewsheds can be utilised to generate a cost surface for an LCP, where what is seen then directs the route taken or even a cumulative cost-surface generated incorporating ruggedness, slope and land-cover (Seaman and Thomas 2020, 560). Determining land-cover for prehistory, given the paucity of data, would be impossible for much of the region though.

Driver's (2005, 470) 'correct path of movement' did not rely on GIS for identification but was based on hillfort morphology and topography. Murray (2016, 26) asserts, the 'correct path' could be derived from least cost paths. However, the term 'correct path of movement' was dropped as it appeared loaded, implying only one path existed. GIS has been utilised to determine "…cultural interactions and social networks" when determining potential routes in the landscape (*ibid.* 51), which could demonstrate the potential for, or absence of, cohesiveness within the region. As with Murray (2016, 52), it was determined that a more holistic approach was necessary rather than interpreting the landscape as just a series of discrete destinations. Some have considered it appropriate to determine whether the entrance to hillforts was aligned to such networks and, therefore, were located in the most accessible locations (*ibid.*). The occupants of the associated hillforts would usually have just one entrance, which in turn would have loaded the weighting for a given route. Furthermore, entrances would not have been located at a particular point just for easy access. However, they may have been influenced by prominence in the landscape or other cultural factors that outweighed the benefits of a more 'logical' route.

Such analysis can be used to predict transport routes (Conolly and Lake 2006, 252), enabling an understanding of how the landscape may have been structured/organised. These routes would be fundamental to understanding how hillforts functioned within the landscape. Furthermore, livestock and wild animals are known to employ preferred routes or LCPs, for example, on steep slopes (Herzog 2014 and 2020, 352). LCPs can also be used to replicate routes, where known, and by doing so, assist in understanding the determining factors of any known routes (Conolly and Lake 2006, 252 – 6). The restraining factors, or costs, would minimise the elevation change and maintain a low slope angle (Madry and Rakos 1996, 113 – 7). Combined with the data produced from the viewshed analysis, other costs could be,

> …the load of the walker, vegetation cover, wetlands or other soil properties, travelling and transport on water, water as barrier and as attractor, aspect, altitude, and social or cultural cost components (Herzog 2014).

Where hillforts are sited in landscapes subject to significant topographic features, such as rivers or precipitous slopes, it is suggested that straight-line distance calculations should be used instead of LCPs (*ibid.*). However, whilst an LCP is not usually employed for areas that have complex geographies, it was used in favour of straight line calculations here, as it results in a more realistic picture. Additionally, when most LCPs were plotted near large rivers, they appeared to be 'channelled' through the closest hillforts/settlements in any given locale.

Initially, when using LCP, it is necessary to generate a cost-surface reflecting the costs from a given origin(s) whilst utilising an appropriate means of transport, such as walking. Secondly, a route is traced from the origin to the destination and back, minimising the accumulated cost (Conolly and Lake 2006, 221 – 5). Walking incurs an anisotropic cost due to the increased effort required when climbing slopes as opposed to descending them (Herzog 2020, 338). In order to overcome such issues, a slope magnitude or an effective slope was calculated, and a cost was ascribed to traversing it. An effective slope overcomes the fact that a path may not traverse the area of maximum slope change but may be parallel or perpendicular to the aspect. It also takes account of the fact that the path may be uphill or downhill.

Herzog (2014a) is critical of many LCP studies as they utilise inappropriate models and the fact that archaeologists tend to rely on their software's standard or default settings. Many issues associated with LCPs, such as choice of algorithm and DEM, are familiar to all forms of GIS analysis. However, factors that can affect LCP accuracy have been categorised by Conolly and Lake (2006, 252 – 5) into:

- Shape of a search neighbourhood limited to just one cell can result in zigzags when the route should be straight, resolved by either increasing the search radius or removing the requirement for the path to pass through the centre of a map cell.

- Model anisotropy - Conversely, at the larger scale, in mountainous areas, zigzags may be expected but are not produced, although algorithms have been created that reproduce 'mountain roads'.
- Model multiple destinations- current production models.
- Use ratio scale costs- It is often not appreciated that costs should be measured on a ratio scale, which can alter the costs of traversing a cell.
- Assumption of the steepest descent- Occasionally, a route may be indicated that drops off a ridge to reduce accumulated costs when people would, in all probability, continue along a plateau, for example.

Additionally, cell size can impinge on accuracy and the layer resolution employed here was 5 m horizontally and 5 m vertically. An awareness of the above factors is necessary to account for any erroneous results and, by utilising the appropriate algorithm(s), avoid them altogether where possible. Using GRASS as a plugin for QGIS, a slope raster was generated from the DTM. This slope raster was then used as an input into r.walk.points to generate a friction layer for calculating the cost or effort of moving across the DTM. Then, r.drain was used to calculate the 'flow' of least cost paths or corridors. Two ways of selecting the most appropriate route are available: Queen's moves allow for eight adjacent target pixels, and Knight's covers 16 pixels. Both allow for horizontal, diagonal and vertical moves (Nir *et al.* 2021, 12). As the aim was to produce optimal routes,

> …the worst case distance between the optimal route and the LCP is a more important performance indicator than the elongation error. This worst case distance is 20% of the path length if the LCP consists of Queen's moves only; including Knight's moves introduces a reduction to 11%; additional A- and B-moves cut down the worst case error to 4.6% (Herzog 2013, 189 – 90 and 2014).

As such, Knight's move was employed within GRASS's r.walk.points to reduce the worst-case distance to 11%. Herzog (2014) observes that few options were available, as most GIS software only supports Queen's moves.

GRASS r.walk.points implements Aitken's 1977/Langmuir's 1984 cost parameters for slopes with the following equation:

T = a*delta_S + b*delta_H_uphill + c*delta_H_moderate_downhill + d*delta_H_steep_downhill

T= Time in seconds delta
S= horizontal distance (metres) delta
H= altitude difference (metres)
(GRASS 2021).

The default values were adopted for a, b, c, d walk_coeff parameters proposed by Langmuir, i.e., 0.72, 6.0, 1.9998 and -1.9998, respectively, which relate to a person's effort in walking under standard conditions (*ibid.*).

Parameters of the walk_coeff:

a: time in seconds it takes to walk for 1 metre on a flat surface (1/walking speed).
b: additional walking time in seconds per metre of elevation gain on uphill slopes.
c: additional walking time in seconds per metre of elevation loss on moderate downhill slopes (use positive value for decreasing cost).
d: additional walking time in seconds per metre of elevation loss on steep downhill slopes (use negative value for increasing cost).
(*ibid.*).

When calculating the LCP, the back-link or movement direction surface, GRASS's implementation of the back-link records the previous cells' value in the chain. When the target is reached, an LCP is drawn back to the origin (Herzog 2014).

GRASS r.walk calculates slope by "….a move between two neighbouring grid cells is derived directly from the differences in elevation and the distance between the two cell centres" (*ibid.*). Herzog (2014) is critical of this approach as it does not allow for the adjacent terrain, give breadth to the path or allow for the fact that a contour path, on a steep slope, may require works to facilitate its presence. Given that much of the area where LCPs are to be constructed lies below 244 m OD, this should not cause significant problems with the resultant paths though. However, it should be noted that

LCPs can occasionally proceed straight up slopes of 40% (21.8°) for one-way paths, and therefore, caution should be exercised in areas with particularly steep slopes.

Lock and Pouncett (2010, 192 – 3) opine that this striving for accuracy seems at odds with subjective decisions made by someone walking in the landscape. However, many walkers would be making objective decisions based on their knowledge of a given area, although there is some truth in the aforementioned assertion. Rather than a precise route, the pedestrian enters a 'corridor of intentionality' or 'least cost corridor' rather than a sharply delineated path and is directed by waypoints (*ibid.* 193). A compromise was sought between the opposed positions of Lock and Pouncett, and Herzog; in that the actual route is not completely defined by the LCP produced, but is the sum of what it may pass through or by, i.e. monuments and important geographical features. As would be expected, LCPs frequently run along water courses, and, as such, it was necessary to identify crossing points, as they would otherwise have acted as barriers to movement. Although relevant, social or cultural costs are often difficult to identify and include in a cost model with any accuracy, and, as such, no attempt was made to factor in these parameters, although they were included on the various maps produced. These costs could include an aversion/attraction for a given landscape feature, such as a monument. However, correlations such as this may indicate a through route, but do not necessarily have to be contemporary with hillforts (Murray 2016, 55). What may be key is the cultural significance and monumentality of these waypoints to those utilising the path.

In extracting LCPs, the algorithm was run between sites (nodes) connecting nearest neighbours, an approach taken in K-nearest neighbour networks (Brughmans and Peeples 2020, 282). The logic for taking this approach is that one would have, in all probability, had more of an affinity with ones' neighbours given their proximity to one another.

Viewshed Analysis

As observed by Gillings and Wheatley (2020, 313) the visual properties of a site's location periodically had a role to play in activities associated with the site, and accordingly necessitate analyses of visibility. Cairns, for example, are prominent in the landscape emphasised by their location, structure and the element of ‘bigness’ required to serve as a focus, centre or goal (Higuchi 1983, 183, and Rylatt and Bevan 2014, 230). Regarding cairns, such structures could have operated as “…significant nodal points in the socialisation of the landscape” or acted as waymarks (Rylatt and Bevan 2014, 230) . By analysing such properties it may be possible to discern how a landscape was utilised in prehistory (Gillings and Wheatley 2020, 313)

Given that the period under study had only a limited means of communication available to it over any distance, such as a beacon, it may have been necessary to maintain a line of sight, particularly in border areas or marginal areas. This requirement also explains, in part, the locating of some hillforts in these prominent locations, which would allow the local community to exert a more significant influence over the surrounding area, if necessary, by rapidly facilitating a message. Murray (2016, 43) describes this as ‘visual access’ when describing what the occupants of a hillfort can see from inside it.

Although a 10 m cell resolution is considered satisfactory for visibility analysis, one should always utilise the highest available resolution (Kormann and Lock 2014, 428). The more up-to-date OS Terrain 5 was utilised, as the DTM at 1:10,000 is based on a 5 m grid with 5 m vertical intervals for contours, which then gave a better resolution for viewshed analysis within QGIS. Other authors, such as O’Driscoll (2016, 429 and 2017a, 75), utilised NASA's SRTMGL1 radar interferometry data at a resolution of 30 m pixels, although acknowledging the shortcomings of the data at this resolution.

Viewshed analysis, as utilised in various GIS packages, comes under various guises, such as visibility analysis, intervisibility, multiple viewer points, line of sight and isovist field. However, there are subtle differences between them, such as with intervisibility, where given points are checked for their intervisibility, whereas a viewshed, strictly speaking, relates to the number of target points visible from a given location. The viewshed plugin used was ‘Visibility Analysis’ created by Čučković (2021, version 1.6). Viewsheds can then be subdivided further into single, multiple and cumulative. The technique has been employed concerning the siting of monuments within landscapes vis-à-vis views of the sea, reciprocity of views between monuments and their prominence, amongst others (Conolly and Lake 2006, 225).

Binary or single viewshed analysis, where visibility is represented by a grid of cells with the value 1 or 0 that indicates whether a cell is visible or non-visible, has had its critics (Bitrià 2008). Unfortunately, as observed by Bitrià (2008), the alternatives usually only address specific methodological problems, which still leaves other such issues to be tackled and, therefore, doubts arise over the resultant data's veracity. The alternatives include applying visual ranges or bands, although such approaches are rarely utilised in archaeological research (*ibid.*). The approach utilised by Higuchi was to have three such bands utilising visual indexes. For the short distance view, "...trees are recognizable as individual units from any point of observation.", is utilised (Higuchi 1983, 12) or 60 times times the size of the predominant tree species (Bitria 2008). Long distance views, trees contours are indiscernible and "...the eye can observe only major topographical features such as valleys or crests or clustery distributions of plant life.", (Higuchi 1983, 14) or at 1100 times the size of the aforementioned tree (Bitria 2008).

A multiple or cumulative viewshed map is "…the logical union of two or more viewshed maps…" where 1 indicates that a point is visible from one or more locations and 0 is not visible (Conolly and Lake 2006, 227). Whereas with the cumulative viewshed approach, the number of integers is tied to the number of viewpoints, and each cell has a record of the number of viewpoints it is visible from. Furthermore, a total viewshed or isovist field can be taken that includes the sum of all the visible points for all viewpoints.

Factors that can and do influence viewshed accuracy have been categorised by Conolly and Lake (2006, 228 – 32) into:

Computational Issues

- Algorithms employed to undertake the analysis. Due to the different algorithms utilised by the various software packages, results differ accordingly.
- Curvature of the Earth, whose influence is exacerbated over distance and is often not addressed by the software.

Experimental Issues

- "Edge effect" can adversely affect the data when the imposition of a boundary truncates it, but this can be overcome by employing a buffer if comparative analysis is required.
- Reciprocity can occur when the observer cannot observe the target, which is aggravated by the increased disparity of offset, such as height, between that of the observer/target.
- Sensitivity can significantly alter the viewshed shape. As such, it is worth analysing the data with differing parameters, such as observer height, to test the sensitivity of the data to minor parameter changes.
- DEM (Digital Elevation Models) as discussed below.

Substantive Issues

- Observer height could be addressed by employing a range of heights or maximum/minimum height of the observer.
- Visual acuity of the observer is not that of the software employed and does not consider adverse weather conditions.
- Palaeoenvironmental conditions can include vegetational cover and anthropogenic alterations to the prevailing morphology.
- Contrast of the site's fabric, for example, if it were constructed of freshly cut chalk when compared to the background material.

DEMs, sometimes called DTMs (Digital Terrain Models), which form the basis of much GIS analysis, including terrain analysis, are prone to several factors that can negatively affect the quality of the resultant data. These factors include the resolution (both vertical and horizontal of the dataset), the topography of the area, and the software utilised to create the DEM. Furthermore, when creating a DEM, it is best to utilise spot heights and contours when interpolating the data (available in the OS Terrain 5 dataset (*ibid.* 100 – 11)). As pointed out by Herzog (2014a), *"…*the effects of erosion, landslides, meandering rivers, bulk material extraction, terracing and change of the sea level…" have the potential to affect the results of any analysis undertaken adversely. As such, it was necessary to consider the potential for such eventualities at each site, particularly regarding urban expansion, quarrying and the tipping of spoil.

Bitrià (2008) observes, "Since the hillforts encompass large areas of a given hill-top, a single viewpoint viewshed would not seem appropriate". Viewsheds produced from a single viewpoint only partially represent a site's potential viewshed, as individuals would be mobile and could seek out the best point to view a given location (*ibid.*). Therefore, a multiple viewer point approach was implemented, although a single viewpoint model was run to determine what, if any, differences there were. Twenty random points (generated by QGIS), at a minimum distance of 2 m between points, were generated within the inner polygons, as defined by the inner edge of the enclosing bank, produced for hillforts and promontory forts. At this level, all 20 points were generated for every available polygon. Point generation started to drop off at a greater distance between the random points because of the minimum distance constraint. Other authors have adopted this approach but are silent on the number of random points generated to facilitate the calculation of the cumulative viewshed; for example, O'Driscoll (2017a, 75). The danger with this approach is that the random results may be clustered or emphasise a given aspect. However, it does give a more complete picture of the cumulative viewsheds, and the minimum distance combined with the number of random points generated minimises the risk of clustering. Murray (2016, 48 and 2019, 119) adopted a view grid approach based on 49 points, but given the volume of data here, this approach was not possible and would seem excessive for the smaller hillforts.

When generating viewsheds, one particular issue that had to be considered was the presence of earthworks that had probably been subject to significant levels of erosion and may also have included a palisade (*ibid.* 36). Given the potential variability of erosion across sites, it was determined that the viewsheds should be plotted at current levels. Murray (2016, 36) adopted a 5m level to allow for erosion and a palisade, which may or may not have been present and would also imply a more martial view of hillforts. The hillforts included within the southeast Wales region, by Murray (2016), included the Hardings Down hillforts and The Bulwark, Gower. Hogg's excavation in 1962 showed no evidence of a palisade at Hardings Down West Fort within the 4ft (c. 1.22 m) wide transect trench, deemed not worthwhile widening (Hogg 1973, 58). Furthermore, the HER record for The Bulwark contains no reference to a palisade despite excavation in 1957 (Archwilio 2004). As such, to make an allowance for a palisade as a matter of course may be unwarranted and even result in misleading findings.

The default setting viewer height for the 'Visibility Analysis' plugin for QGIS was 1.6 m, but to allow for comparative analysis, with Murray (2016, 36) and others, a 1.7 m height was adopted. This represents the rounded-up height data for males extracted from osteological data (Chapman 2006, 85 and Murray 2016, 44). Any marginal differences between the heights of individuals could also be addressed by creating a small, in terms of surface area, low-raised platform of 300 mm. Such platforms may also provide an alternative explanation for the presence, at least for some, of the four-poster structures found in hillforts. They could facilitate a viewing platform of 2 m plus with relative ease. Furthermore, the 1.7 m observer height is what most such studies utilise when undertaking viewshed analyses (Chapman 2006, 85). This then addresses the substantive issue of height raised by Conolly and Lake (2006, 228 – 32).

The viewsheds were initially plotted utilising the 1.7 m viewer height from the current surface level and then an additional 2 m to allow for the potential for a raised platform. Allowance was also made for the curvature of the Earth and atmospheric refraction when calculating the cumulative viewsheds, although the effects are more significant at c. 10 km with a reduction of approximately 20% (Kormann and Lock 2014, 433); given this, a radius of 5 km was applied to the cumulative viewsheds. This then addresses a computational issue raised by Conolly and Lake (2006, 228 – 32) and covers atmospheric refraction, which is not mentioned. Four discretionary classes were produced to represent visual coverage in the area: none, low, medium, and high coverage on a graduated colour scale (O'Driscoll 2017a, 75 and Čučković 2020).

Conclusion

The methodology is somewhat detailed, but this is essential to ensure that the resultant findings have credibility. From the outset, it was incumbent to consider the shortcomings of the available data, such as the absence of a chronological framework for the sites, which invariably limited the project's parameters. For example, testing the hypothesis that climate change at the end of the Bronze Age unfavourably affected settlement in the marginal areas of Wales. However, it was possible to determine the spatial characteristics of sites and their geographical propensities. The predictive capabilities of GIS should also allow for the testing of any hypotheses by either a geophysical survey or digging such potential site(s). Furthermore, it may reduce, ultimately, the apparent imbalance in occupation sites for southeast Wales when compared with southwest Wales, where such sites are more easily discerned.

By utilising GIS to create LCPs, it may be possible to demonstrate how cohesive an area was in terms of communication, including trade, as opposed to how isolated contemporary society was thought to have been by some writers. By applying the concept of ‘corridors of intentionality’ or ‘least cost corridors’ and utilising visibility analysis, the resultant LCPs can be seen in a broader cultural setting. Regarding buffering, a clear visual indication on a map of the proximity of something to the host can be obtained, such as hillfort to hillfort or hillfort to water and, therefore, the likelihood of utilising a given resource.

Nearest neighbour levels provided an indication, on a spectrum, from clustered to dispersed, indicating the nature of the distribution of such sites. Given that nearest neighbour is more appropriate in detecting first neighbour associations and, therefore, not particularly useful in determining multi-scalar distributions, it was determined that it was appropriate to augment nearest neighbour with a k-means statistic. This approach also allowed for the testing of Lancaster’s (2014, 6 and 33 – 7) perceived clusters that were, in turn, utilised to demonstrate the presence of a federal clan structure for the Silures. Should Lancaster’s clusters lack statistical validity, it would go some way in undermining this hypothesis. It will also allow for the testing of the assertion made by Audouze and Büchsenschütz (1991, 178) that settlements in Britain have a propensity for being dispersed, at least for southeast Wales.

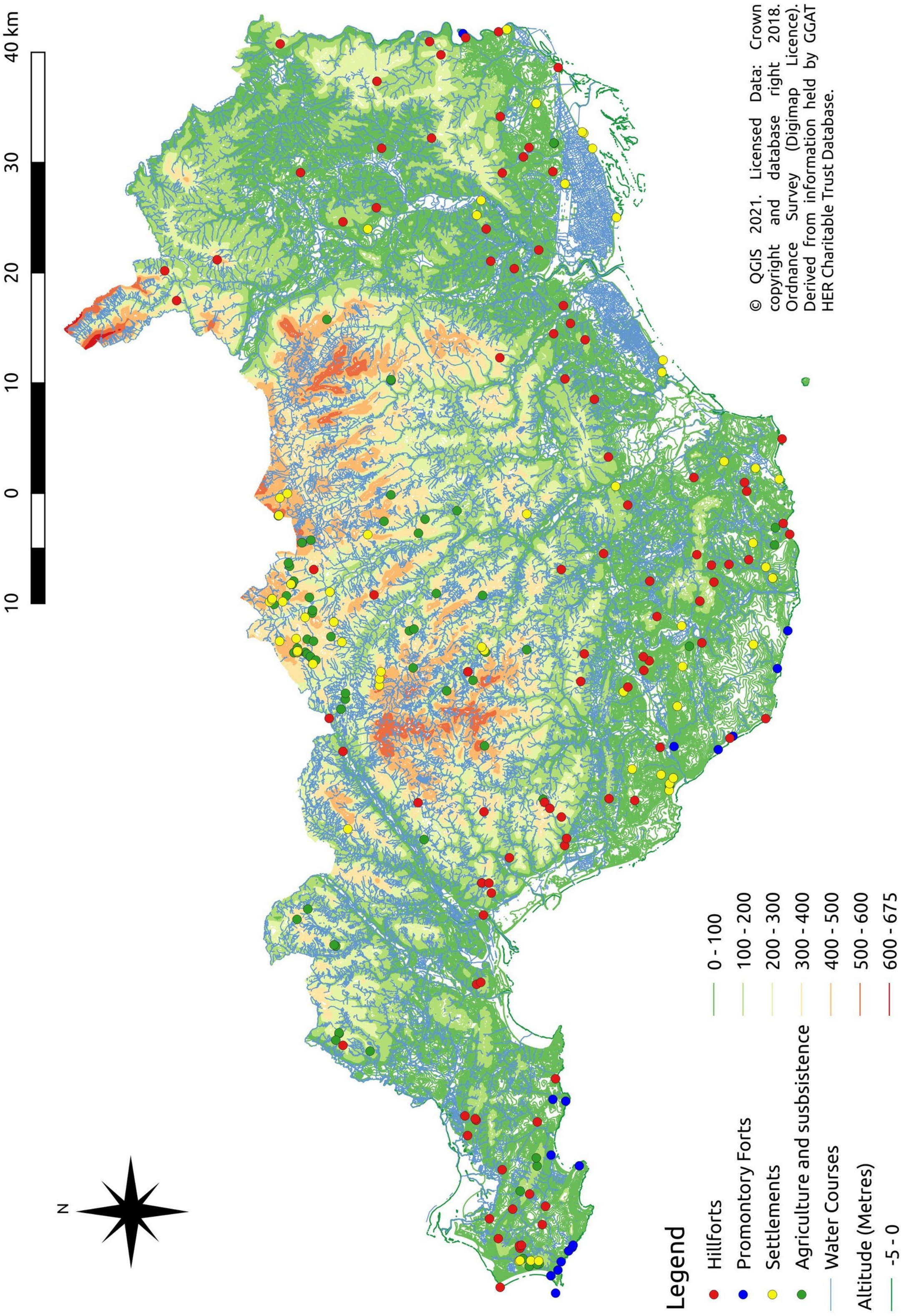
Chapter 7: Geographical Data Analysis

Introduction

As set out in Chapter 1, the primary aim of this chapter is to review the available geographical data and discern what, if any, parameters were relevant in the selection of a given location by later prehistoric peoples in southeast Wales (see Figure 16). The parameters addressed include altitude, proximity to water, aspect, geology and soil morphology. Such an approach should be caveated with the observation that once population growth caused land pressure, more marginal and less desirable sites would have been used. Whilst these sites may initially have been suitable when occupied; the soils would, when subsequently cleared of the climatic climax vegetational cover of woodland, have deteriorated fairly rapidly once exposed to the prevailing climatic conditions and exploitation by later prehistoric peoples.

Rather than just asserting that a given parameter was material in selecting a location, it was deemed appropriate to statistically test, by using chi-square, the significance of the differences between observed and expected frequencies to determine if there was a relationship between the variables. At this point, should there be a relationship between the variables, one has to develop a narrative from the available evidence to try and explain the result. Due to the requirements of the technique, when more than 20% of categories have fewer than an expected frequency of 5, the number of categories has to be reduced (Wheeler *et al.* 2004, 166). As such, this required combining the following categories: settlements and agriculture, and hillforts and promontory forts for the test. Promontory forts would frequently fail to have sufficient entries, given their low-level presence in the region, and rather than lose invaluable data, it was determined that they would be better merged with hillforts, as opposed to settlements. Given the adoption of the Atlas' approach, it would be entirely appropriate to combine them.

Figure 16: Sites by type, located topographically, for later prehistory in southeast Wales



Geology
A soil's primary formative material is the underlying bedrock; therefore, geology has a role in its analysis. Geology, as such, should have a relatively important role, albeit within the region, it is frequently overlain by superficial deposits due to glacial activity (see Figure 6), although aeolian and marine activity has also had a role to play. It was therefore considered appropriate to assess the soil mineralogy and soil matrix of the region rather than the bedrock geology. Notwithstanding this, the geology merits inclusion in any regional review due to its impact on significant topological features.

The prevalence of deep sided valleys, their orientation and their high altitude, will have impacted the region's microclimates. For example, frost pockets can occur when cold air sinks and pools due to an obstruction or a low point, such as a valley floor. A late spring frost could then decimate a crop of early sown beans, but avoiding areas susceptible to frost pockets or planting less vulnerable crops would have been a solution. In these areas, aspect would have a role in the rate at which a slope warms up during the day. Its overall impact would be minimal in low-lying flat areas like the Levels though.

Soils and vegetational coverage
Regarding pedogenesis, the main influencing factors are the parent material, prevailing climatic conditions, vegetation, organisms (including human activity) and time (Acott 1998, 74). As indicated above, prevailing bedrock geology may become overlain by significant superficial deposits whose origins are remote from where they were deposited. As such, when considering the potential soil types for a given locale, regard should be made to the presence of these superficial deposits.

Sandstones generally produce relatively acidic poor soils due to their inability to retain moisture or nutrients, as they are comparatively free draining. Furthermore, quartz is the principal constituent of sandstone and is chemically inert, preventing it from adsorbing cations to act as a source of plant nutrients (O'Hare 1988, 10). The fact that sandy soils are well aerated leads to the rapid decomposition of organic material, leaving little or none for growing plants. As such, heathland habitats tend to predominate in these areas, where progression to tree coverage is delayed by browsing or fire.

During the Bronze Age, Bell *et al.* (2013, 7) consider that the lighter soils, such as those found above Lias, Oolite and Carboniferous Limestone, would have been utilised for arable farming, whilst the poorer soils in upland areas and the Levels, may have been used for grazing on a transhumance basis. Seasonal grazing does not preclude the use of heavier soils for arable farming though, as there is evidence for the ploughing of clayey soils on the southern side of the Severn (*ibid.*). Given its proximity to the region and the similarity of environmental conditions, it would not take a great leap of faith to envisage ploughing, where similar environmental conditions prevail, within the region. The Old Red Sandstone, with the caveat that they do not always constitute sandstone, in southeast Wales produces soils richer than those above the Ordovician and Silurian rocks (George 1975, 6). Therefore, they would have been a prime candidate for early farming but, as previously observed, would be more susceptible to podzolisation, where they constitute sandstone.

Post-glacial vegetational coverage would have been forest in the region, as climatic climax vegetational cover, on all but the highest peaks and those areas adjacent to the Severn. This vegetational coverage would have resulted in brown earth type soil in many locations, given sufficient time for the build up of organic material. Following the late glacial period, such brown earth type soils are considered to have formed up until the Bronze Age (Aston 2002, 24). This woodland coverage would initially, in the Neolithic and EBA, upon clearance have provided fertile soils for low intensity shifting agriculture. The 'return time' to a state of climatic climax vegetational coverage would depend on various factors influencing the site's tendency towards marginality and the absence of anthropogenic influences precluding succession, such as muirburn. With a growing population and the associated land pressure, such soils may have struggled to sustain viable arable agricultural farming. However, these types of sandy soils warm up earlier in the year than clayey soils and are easier to work on, which would have enabled farmers to sow crops earlier.

Deforestation would have occurred as a prelude to farming. The changes that accompany deforestation are a decrease in mean humidity, increased wind speed and increases in the maximum and minimum range of soil and air temperatures (Tivy and O'Hare 1987, 62). These generalisations are subject to change due to forest composition, season, time of day and slope angle. The effects on the hydrological cycle are to reduce evapotranspiration and, as a result, increase water run-off, both surface and sub-surface, which would engender increased levels of soil erosion, particularly in upland areas. These hydrological changes, in turn, disrupt nutrient cycling within the area due to the increased leaching of nutrients from the soil. In time, this could lead to the deterioration of the soil from that of a brown earth formed under woodland conditions, ideally suited to farming, to one that is more podzolic. These changes would be compounded further by any deterioration of macro-climatic conditions, poor soils, high slope angle, farming practices and remaining vegetational cover.

Throughout the Bronze Age, in Wales, there is palynological evidence of growing woodland clearance as lime (*Tilia*) declines, at some sites, elm (*Ulmus*) as well (Caseldine 1990, 55 – 56). On the Gower, palynological evidence from beneath the ramparts of Harding's Down West indicated the presence of an oak 'forest' (Crampton 1973, 68). This oak forest is seen to have "…declined somewhat from its maximum extent during the Bronze Age" and, by the time of the hillfort's construction, had been clear-felled (Crampton 1973, 68). Palynological evidence from Ireland conversely indicates natural re-afforestation and the expansion of moorland in certain areas after the agricultural clearances of the Late Bronze Age (Raftery 1994, 36 and Bell 1995, 153). Some areas of Britain may have exhibited a similar response. After all, this would be the expected successional path once the influence of people is removed or minimised, thus allowing natural succession to take place, culminating in climax vegetational cover.

Human activity can improve the soil's viability for farming by employing various techniques such as manuring, ploughing and the excavation of drainage ditches, as practised by Iron Age communities, and therefore must be a material consideration when determining how an area may have been farmed (Harding 2017, 10). Other methods may have been used, which include fallow periods, the sowing of leguminous crops and crop rotation all of which would have increased agricultural productivity in the Late Bronze Age. The presence of nitrogen fixing nodules on the roots of leguminous plants would have fertilised the soil for a subsequent crop.

The adoption of various methods to maintain soil fertility in non-marginal areas is suggested by the occupation of many settlements continuously for centuries. The proliferation in the adoption of the bronze sickle indicates increased levels of agricultural efficiency, though some doubt the efficacy of such tools. Further to this assertion, Ostoja-Zargórski (1989, 394) argues that the climatic downturn in the Early Iron Age with "…the modest range of tools…" available only allowed limited intensification in agricultural production and then only into areas with easily worked soils. Nevertheless, Reynolds (1995, 178) observes that the ard can work in heavy loam soils and the lighter rendzinas, i.e., humus rich shallow soils. An example of such an ard was found at Eton, Berkshire, close to a contemporary Bronze Age field system and radiocarbon dated to 900 – 760 BC (Denison 1997, 5). Modern perceptions of productivity must also be set aside when considering the lower subsistence levels prevailing at the time, although surpluses were produced, as evidenced by four post-structures.

Proximity to water

Three-quarters of hillforts located within the catchments of the Severn, Wye and Usk are less than 2 km from a river (Brown 2009, 88; and Lock and Ralston 2022, 295). Far more readily available though would be a hillfort's adjacent streams or springs (Brown 2009, 88).

Figures 17 and 18 show that most c. 91% of the sites in southeast Wales are within 500 m of a watercourse and 51% within 250 m. The buffered area at 500 m does, however,

Figure 17: Proximity to water, by site type, utilising a 500 m buffer based on water courses

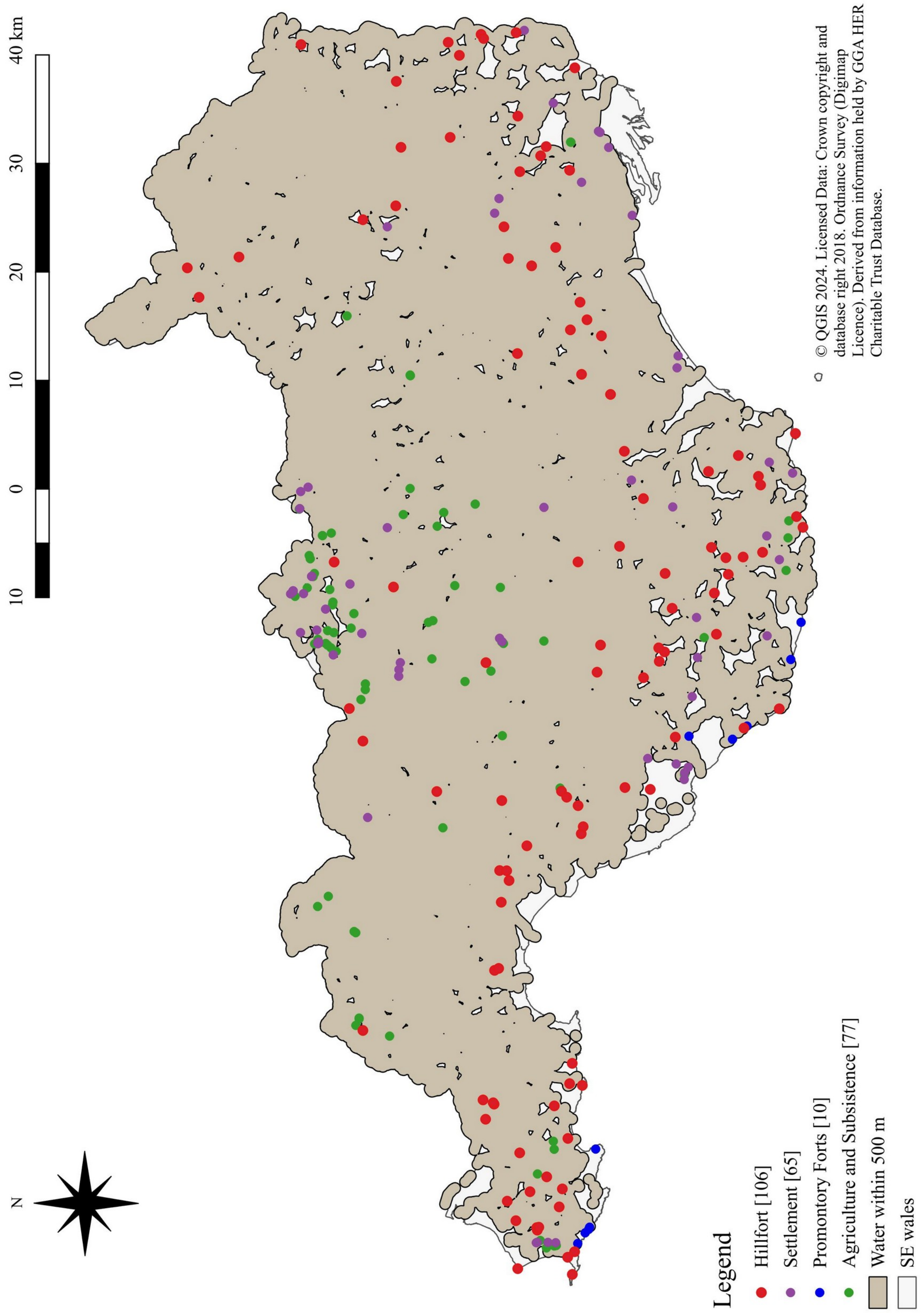
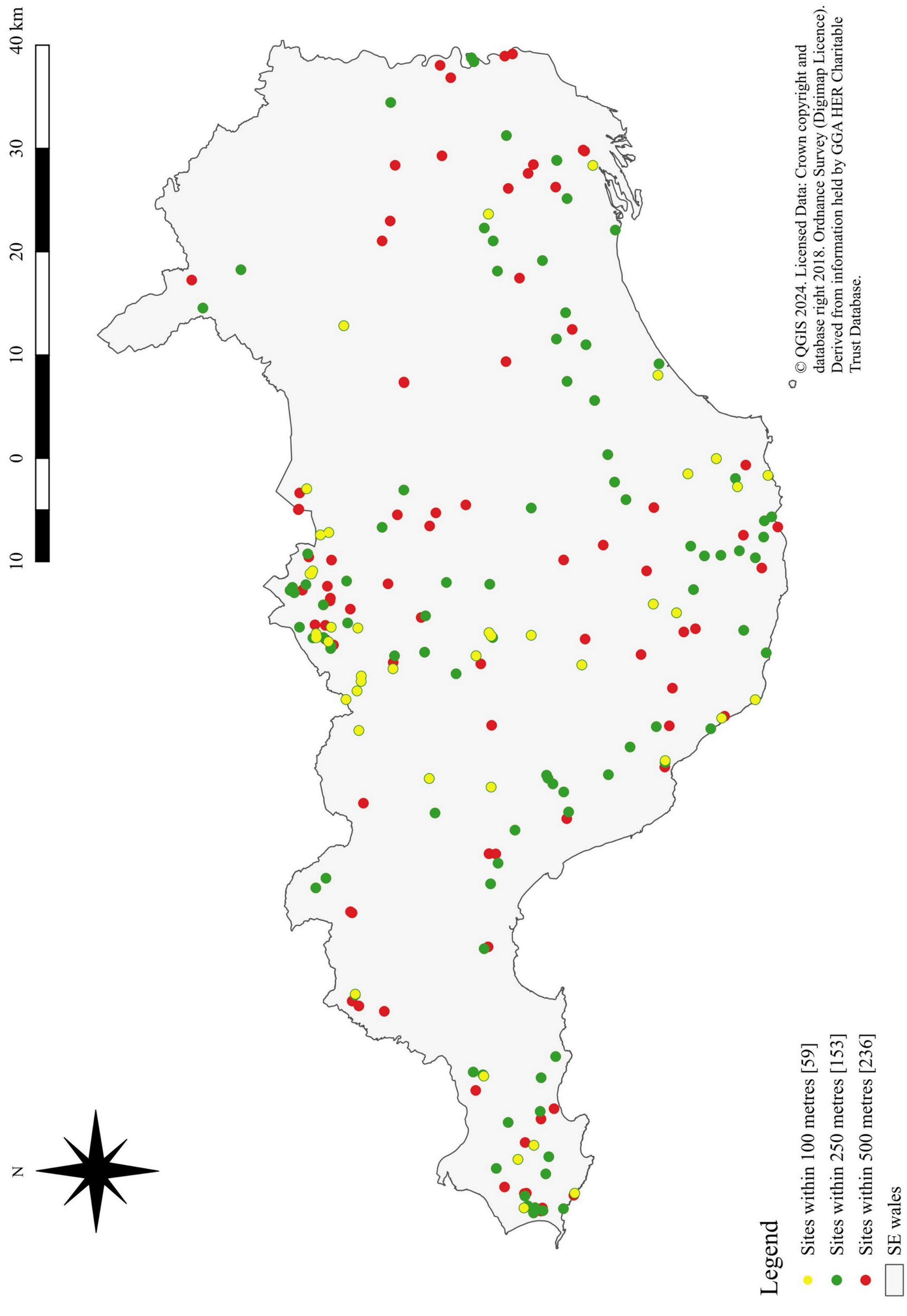


Figure 18: Proximity to water buffered by site for those within 100, 250 and 500 m intervals



cover the majority of the region at 98.56% and, as such, the availability of water should not have been an issue for later prehistoric farmers; when buffered at 250 m the area covered is 77.87%. Even allowing for the movement of water courses due to meandering, water is unlikely to have been a limiting factor for most regional settlement locations. In addition, many small springs that could have provided a water supply for a settlement's inhabitants may have existed or may not be marked on modern maps. In the coastal areas, water would have been brackish in the Levels, but a relatively short walk would have facilitated a source of potable water. There are usually multiple sources, however, within 500 m of a site, and as previously mentioned, this is not even dependent on the presence of minor springs that the OS may not map.

When considering the availability of water, one should refrain from imposing modern urban perceptions or expectations for the provision of water. After all, it took until the 20th Century for the widespread availability of potable water to be supplied directly to people’s homes in the UK. Prior to this, families would have relied on communal wells, springs or watercourses for their needs, much as they would have done in prehistory. Lock and Ralston (2022, 295) observe that just 5.3% of hillforts (178) had a potential water supply within the centrally enclosed area and that 90% would appear to have none at all. Demands by livestock for water would have been high, particularly for cattle, necessitating a reasonably close supply ((see Table 2) *ibid.*).

For a pastorally based agrarian economy, 500 m would present no challenge for watering livestock, as the stock could be driven to water when required, or they would water themselves, where they were free-ranged. Despite this fact, assumptions are frequently made about the preference,

> …for valley-sides dominating springs or streams, suggesting that here, as in the south-west, the enclosures were constructed by predominantly pastoral communities more concerned with watering their flocks and herds… (Cunliffe 2005, 293).

Such assertions carry little merit in later prehistory for southeast Wales, given the ready availability of water. Additionally, avoiding valley floors may relate to flood events rather than watering stock or even the absence of evidence on the valley floors due to modern farming erasing the evidence. As observed in Chapter 5, this emphasis on a pastoralist economy is probably unjustified and is reliant on the absence of evidence for enclosure for its validation. Nevertheless, Lancaster (2012, 10) observes that the lowland areas within the region provide a more conducive environment for occupation when compared with the adjacent upland areas, which is reflected in the lowland area's long history of habitation.

If a flowing water source were unavailable, dew ponds or wells may have been excavated. Wells are uncommon in settlements dating from the southern British Iron Age, although one was present at Whitton ((GGAT 00382s) Davis 2017, 340). In all likelihood, this would have been unnecessary in most of southeast Wales if the land were held in common. In such a scenario, only limited levels of enclosure are necessary to prevent animals from browsing crops. Arable farming, however, requires proximity to water, as a dry spring can stunt crop growth and seeds fail to germinate. In such cases, arable fields require a readily available supply of water or soils that would retain moisture, such as clayey or humus-rich soils. Additionally, mulching may have been used to retain soil moisture. As seen above, sourcing water was unlikely to have been a problem for most people, particularly for pastoralists. Given the ubiquitous presence of water in the region, statistically testing this was considered unnecessary.

Altitude

Soil and climate are two of the most essential factors, excluding water, when determining a suitable location for occupation for early agrarian economies. As previously discussed, the temperature declines with altitude with an average environmental lapse rate of about 6.5 °C per kilometre and therefore the temperature could be c. 4 °C lower in the region's highest areas when compared with the coast (O'Hare and Sweeney 1986, 81, and Anderson *et al.* 2007, 412). This lapse rate is affected by the degree of saturation of the air mass in question though. To this end, the proximity of the Atlantic with the prevailing westerlies would marginally mitigate this state by reducing the lapse rate to between 5 – 6 °C. These upland areas would be subject to a shorter growing season and generally poorer soils but be suitable for seasonal grazing.

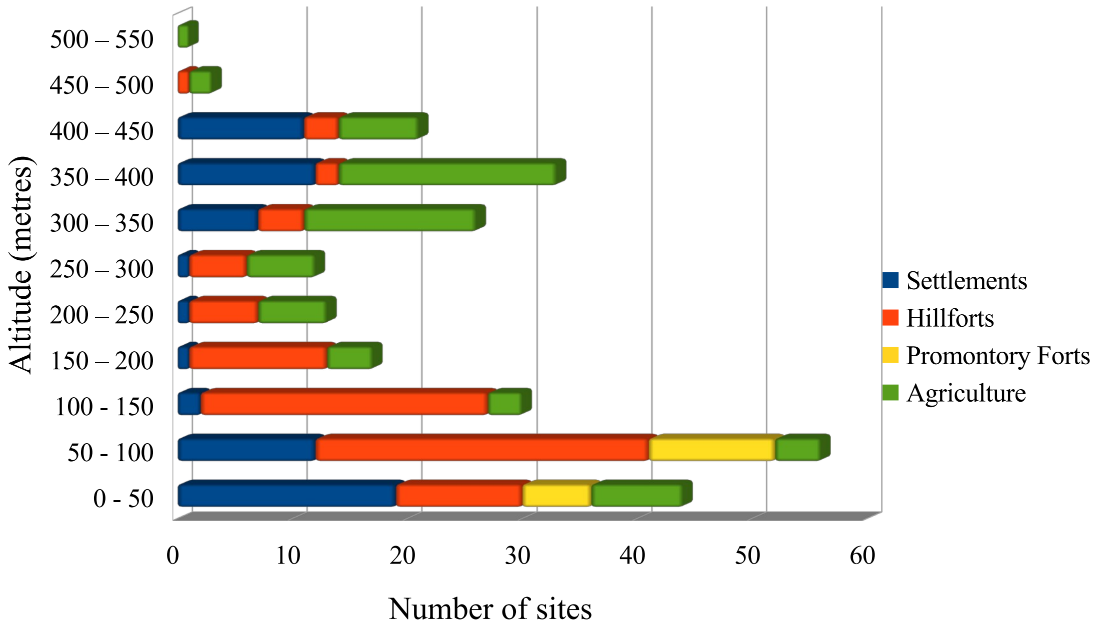
The two hypotheses are:

Null Hypothesis: There is no association between altitude and the distribution of sites.

Alternative Hypothesis: There is an association between altitude and the distribution of sites beyond that which might be expected by random variation.

As seen in Figure 19, all forms of sites tend to predominate below 150 m, excluding evidence for agriculture. The critical value of 29.59, at the 0.001 significance level, was

Figure 19: Site type by altitude



exceeded by the test statistic of 85.78 and 148.01 for settlements and agriculture and hillforts/promontory forts, respectively (see Table 3). Therefore, at the 99.9% confidence level, the null hypothesis can be rejected. In that, there is no relationship between altitude and the distribution of sites. Alternatively phrased, there is an association between altitude and the distribution of sites beyond that expected by

Table 3: Site type by altitude.

Altitude (metres)	Percentage of region	Settlements and agriculture	$\frac{(O-E)^2}{E}$	Hillforts and promontory forts	$\frac{(O-E)^2}{E}$
0-50	23.12%	27	$(27–12.82)^2$ /12.82= 15.684274571	17	$(17–10.45)^2$ /10.45= 4.105502392
50-100	22.12%	16	$(16–12.82)^2$ /12.82= 0.788798752	40	$(40–10.45)^2$ /10.45= 83.560047847
100-150	11.62%	5	$(5–12.82)^2$ /12.82 = 4.770078003	25	$(25–10.45)^2$ /10.45= 20.25861244
150-200	9.17%	5	$(5–12.82)^2$ /12.82= 4.770078003	12	$(12 –10.45)^2$ /10.45= 0.229904306
200-250	8.57%	7	$(7–12.82)^2$ /12.82= 2.642152886	6	$(6–10.45)^2$ /10.45= 1.894976077
250-300	6.66%	7	$(7–12.82)^2$ /12.82= 2.642152886	5	$(5–10.45)^2$ /10.45= 2.842344498
300-350	5.47%	22	$(22–12.82)^2$ /12.82= 6.57351014	4	$(4 –10.45)^2$ /10.45= 3.981100478
350-400	4.59%	31	$(31–12.82)^2$ /12.82= 25.78099844	2	$(2–10.45)^2$ /10.45= 6.83277512
400-450	3.18%	18	$(18–12.82)^2$ /12.8 = 2.09301092	3	$(3–10.45)^2$ /10.45= 5.311244019
450-500	1.84%	2	$(2–12.82)^2$ /12.82= 9.13201248	1	$(1 –10.45)^2$ / 10.45= 8.54569378
500-550	0.8%	1	$(1–12.82)^2$ /12.82= 10.89800312	0	$(0 –10.45)^2$ / 10.45= 10.45
Total		141	85.78	115	148.01
Significance level 0.001 Critical value 29.59			√		√

Degrees of freedom = 10

random variation. However, at this juncture, it is worth reiterating that rejecting the null hypothesis does not mean the alternative hypothesis is correct. It is a matter of interpretation, as several other scenarios might account for rejecting the null hypothesis, which should be considered (Aldenderfer 2005, 514). Notwithstanding this cautionary note, one would expect a decline in intensity of occupation associated with an increase in altitude becoming more pronounced at the uppermost elevations.

The test statistic corroborates that the distribution has not occurred by chance, as approximately 39% of all sites occur below 100 m altitude, which accounts for approximately 45.24% of region's area. Nonetheless, something less straightforward appears to have happened here, as there is a decline in the number of settlement sites until the 300 m level, at which point the evidence for agriculture and settlements increases again. Figure 19 may indicate the absence of data for settlements that should be present between 150 and 300 m altitude range. Above 450 m settlements are absent and this may reflect the inhospitable conditions for occupation above this level. Hillforts follow a more steady decline in numbers with altitude, likely indicative of what should be happening with agriculture and settlements. By their very nature, hillforts often require a prominent geographical location to emphasise their monumental nature. Therefore, hillforts could act as a proxy indicator of the broader expected settlement levels.

As previously observed, Brown (2019, 33) calculated that approximately 89% of all hillforts in England and Wales are below 300 m in altitude. The figure for southeast Wales is 91.3%, thus corroborating Brown's findings. In the central Black Mountains, hillforts are largely absent except along their northern periphery to the south of Brecon. Most hillforts are below 200 m in altitude, and at this level account for approximately 82% of all hillforts/promontory forts. It would indicate that whatever their role may be, it was primarily but not exclusively linked with an altitude below 200 m. Nevertheless, there are outliers at the upper end that include Ysgyryd Fawr at c. 485 m (Table 3: 450 – 500 m in altitude) and to the north is Twyn Y Gaer, Cwmyoy at 423.5 m in altitude, highest and second highest respectively. To the east of Twyn Y Gaer, located on the opposite side of the Vale of Ewyas is Pen Twyn at c. 328 m in altitude. The juxtaposition of these hillforts may have more to do with something outside the region, such as a potential route northwards into the Vale of Ewyas. These hillforts also appear to have more to do with an area beyond the region to the north in Brecknockshire. The Vale of Ewyas falls within Monmouthshire for most of its extent, and Brecknockshire in the north, but such geopolitical orientations may have been very different in prehistory.

When utilising palynology, Caseldine (1990, 55) observed the adverse anthropogenic effects of cereal farming on soils in marginal upland areas in association with a period of climatic deterioration in Wales. It is concluded that this process may have resulted in anthropogenic podzolisation in many areas of upland Wales, including southeast Wales. Evidence for soil acidification, resulting from overgrazing in upland areas, is increasing which, with impeded drainage by 1200–1000 BC, is considered by some to have led to the formation of peat bogs (RCAHMW 2003, 23 – 25). Due to the subtle interplay of these two factors, there may have been a synergistic effect compounding any decline, but to disentangle this goes beyond the scope of this thesis. Increased clearance levels during the first millennium correlate with growth in soil erosion, particularly in the Severn and Avon river valleys in the Midlands (Shotton 1978, 31 and Bell 1995, 151).

At 400 m, the temperature would have been approximately 2.6° C lower than at sea level. It would also have been wetter than the lower coastal margins. As such, it may not have been an ideal altitude for arable farming, although many settlements would have practised mixed farming. Many hillforts, it has been observed, in Wales and the Marches appear to occupy sites that allow for the exploitation of both valley bottoms and upland pasturage, effectively integrating the exploitation of two different environmental zones (Davies 1995, 672 and 676 – 77). It may also be true for other forms of later prehistoric settlement based on this reasoning. However, it appears overly deterministic in its outlook and may rely again on the absence of data for settlements at lower altitudes. Such communities may have utilised the valley floors for arable farming with grazing on a valley's sides. Seasonal grazing was likely practised in the more extensive upland areas due to its marginality. The apparent intensity of the agricultural presence at altitude may be due to the more obvious nature of the evidence, i.e. clearance cairns, for agriculture than its actual intensity. Between the 450 and 550 m, there are no settlements present. Either transhumance or grazing in the uplands on some form of commons basis may have been applicable, which left no evidence, possibly due to its more ephemeral nature. Given the steepness of the valley sides, the stock could have been driven a relatively short distance to these altitudes and the associated plateau areas.

The domestic outlier sites, in the upland areas, are worthy of consideration in their own right, as possible indicators of transhumance, particularly given their inhospitable locations (currently anyway). Domestic sites are mainly concentrated within the lowland zone, that is that part of the region below 244 m in altitude. There is a cluster of sites to the far north of the region, in an area underlain by millstone grit and, as one progresses further north, carboniferous limestone; immediately prior to entering an area dominated by Old Red Sandstone. One such site at 445 m is called Tarren Y Bwlch (GGAT 00163m), which the HER records as being at an even higher altitude of approximately 460 m. This area today is considered marginal and sheep can only be grazed here during the summer months and even then only extensively so. Without subsidies, the area would currently be considered, by many, as being economically unviable. One should not, however, impose modern perceptions of what constitutes viability, from an economic standpoint, on how a landscape could have formerly been utilised in prehistory.

The relatively lower levels of occupation in the 0 – 50 m tranche of data, when compared with that of the 50 – 100 m, may be due to the extensive nature of the Levels and the relative lack of suitable locations for hillforts in this area. A notable exception is Wilcrick, Newport, which is ideally located to access the spring grazing of the Levels. To the south of the 10 m contour and their associated estuarine marshy environs, seasonal occupation may have been possible again for grazing. The Levels would have provided much needed fodder having exhausted available stocks through the winter. To this day, much of the southern parts of Cardiff and Newport fall into this area. The Levels would have been far more extensive in later prehistory, as their drainage commenced under Roman occupation. The archaeology is probably under-represented, although the potential is recognised with much of the area now being designated as an ‘archaeologically sensitive area’. The absence of extensive urban development in the Levels may also account for the lack of archaeological data from watching briefs.

Rising water tables could mean that some areas that were formerly farmed relatively intensively became marshland in prehistory, which would have limited their viability for all year round occupation. The Somerset and Gwent Levels have been subject to marine incursions and flooding from rivers throughout prehistory (Bell *et al.* 2013, 10 and 317). Evidence for Bronze Age occupation has been found on the foreshore at both Rumney and Redwick, Newport in the form of roundhouses at both locations and rectangular structures at Redwick (Bell *et al.* 2013, 297 and 300). Ewart Park type tool marks on the Bronze Age wooden remains indicate that occupation was towards the end of this time frame, though radiocarbon dating indicated a period 1500–1000 cal BC (Bell *et al.* 2013, 155). Occupation of these liminal areas, subject to marine inundation, was facilitated by timber trackways. Seven such trackways have been identified in the Swansea Bay Area, whilst around Goldcliff and Redwick, Newport three trackways and five probable trackways have been identified (Sherman 2011, 1 and Bell *et al.* 2013, 300). In the eastern Gwent Levels, these trackways seem concurrent with roundhouses and rectangular structures, which indicates they had a role in enabling development for the occupation and exploitation of this locale.

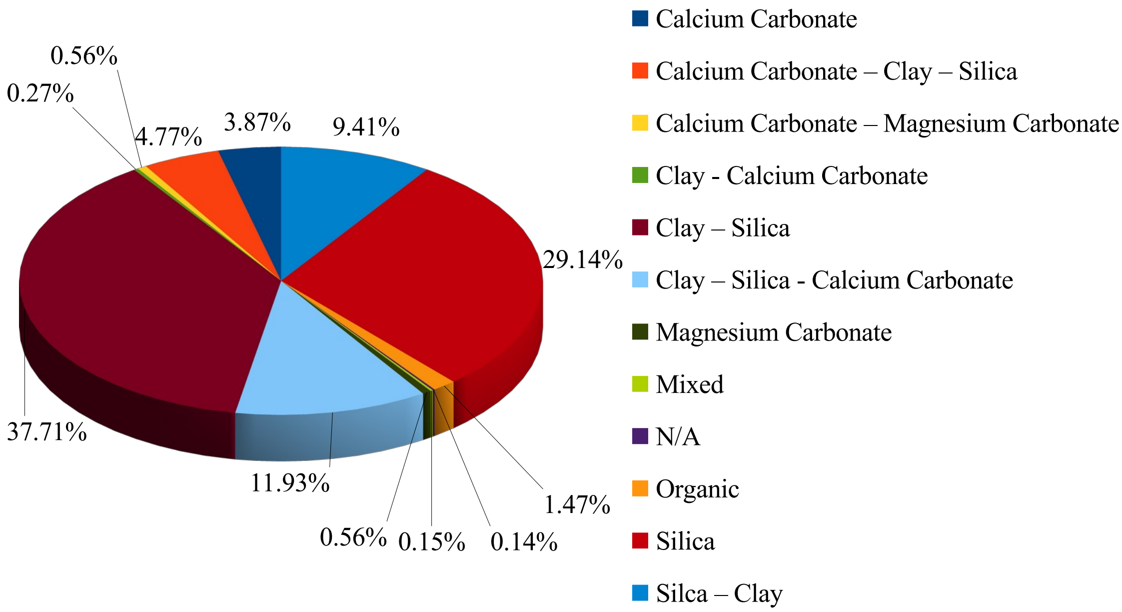
By the mid-Bronze Age, seasonal settlements had become established in coastal areas, sometimes adjacent to salt marsh areas (Bell and Walker 2005, 164). High grass pollen values associated with trackways 8 and 1130 indicate phases of reed swamp development in between estuarine phases at Goldcliff (Caseldine 1995, 81 – 82). Other environmental phases include raised bog, fen/fen woodland and salt marsh, all indicative of environments where the presence of water is the predominant factor. These phases correlate with the climatic downturn in the Early Iron Age. Pollen from indicator species of pastoralism, such as ribwort plantain (*Plantago lanceolata*), have also been found at Redwick, although levels fluctuated over time (Bell *et al*. 2013, 100 – 3).

Soil mineralogy

A soil's primary formative material is that of the underlying geology; as such, the mineralogy of an area may be a feature of a settlement's location as it will influence soil fertility and the ability to work it if necessary. Aside from the primary elements, the secondary elements of calcium, magnesium and potassium are necessary for healthy plant growth; these are present in the water content of soil and adsorbed by clays or humus (O'Hare 1988,17).

As seen in Figure 20, the main mineralogical composition of the region's soils is clay–silica at c. 37.71% of the region's soil, followed by silica based soil at c. 29.14%. The

Figure 20: Simplified percentage breakdown of the region's soils by mineralogy



two categories make up 66.85% of the region's soils based on their mineralogy. The widespread nature of silica within the soil matrix, either as pure silica or present as some mixed variants, such as clay-silica, mean that it features significantly. As previously noted, silica rich soils tend to be free draining, which at higher altitudes produce podzolic soils due to the high levels of eluviation. A swathe of silica rich soils is broadly concurrent with the region's upland areas. A cold/wet phase occurred between

850 – 650/550 BC (see Table 1, Chapter 3, 56), which could have resulted in the leaching out of nutrients on these silica rich soils, resulting in podzolisation.

The two hypotheses are:

Null Hypothesis: There is no association between soil mineralogy and site location.

Alternative Hypothesis: There is an association between soil mineralogy and site location beyond that which might be expected by random variation.

The critical value of 26.12, at the 0.001 significance level (i.e. 99.9% confidence level), was exceeded by the test statistic returned at 267.52 and 114.99 for settlements/agriculture and hillforts/promontory forts, respectively (see Table 4); as such, the null hypothesis may be rejected. It would appear, therefore, that there is a correlation between sites and the mineralogy of the soil. Notwithstanding this, other factors could account for the distribution. It could include farming practices that may or may not have impacted the modern mineralogical content of the soil over the last two millennia. Soil exposed to the elements via ploughing or some other earth-breaking means would leave it susceptible to aeolian removal or loss via run-off during rainfall.

Given the propensity for hillforts to be located on higher ground, it should be no surprise that silica based soils are predominant. Approximately 42% of hillforts are on soils derived primarily from silica. It should not be considered indicative of a causal relationship but as a correlation with other possible factors, such as altitude, available vistas and prominence in the landscape. The lightness of such soils would make them easy to plough/work, but such areas may have been more suited to grazing. A short walk would have been sufficient to source soils more suited for arable purposes, and, again, one should refrain from imposing modern perceptions of what constitutes a short walk.

It is worth reiterating that such sites, including that of hillforts, may have been in areas of brown earth at the time of their construction in the Bronze Age and early Iron Age.

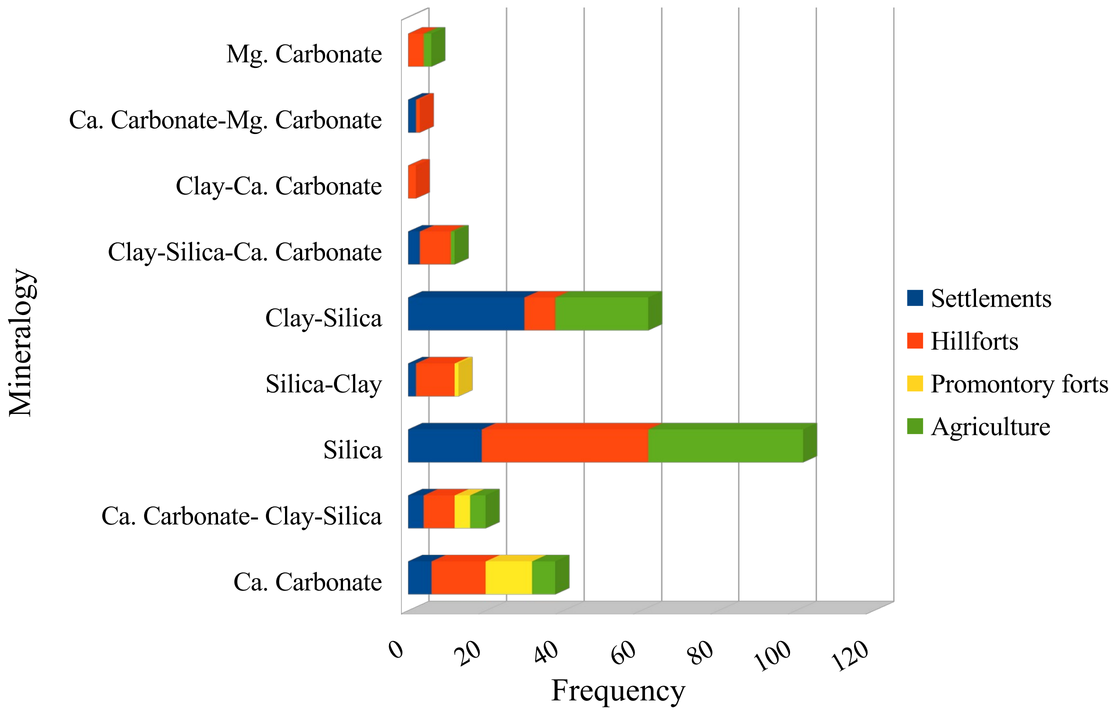
Table 4: Site type by mineralogy.

Mineralogy	Settlements and agriculture	$\frac{(O-E)^2}{E}$	Hillforts and promontory forts	$\frac{(O-E)^2}{E}$
Ca. Carbonate	12	$(12–15.67)^2/15.67=$ 0.859534142	26	$(26–12.78)^2/12.78=$ 13.67514867
Ca. Carbonate-Clay-Silica	8	$(8–15.67)^2/15.67=$ 3.754237396	12	$(12–12.78)^2/12.78=$ 0.047605634
Silica	57	$(57–15.67)^2/15.67=$ 109.008864071	43	$(43–12.78)^2/12.78=$ 71.459186228
Silica-Clay	2	$(2–15.67)^2/15.67=$ 11.925264837	11	$(11–12.78)^2/12.78=$ 0.247918623
Clay-Silica	54	$(54–15.67)^2/15.67=$ 93.758066369	8	$(8–12.78)^2/12.78=$ 1.787824726
Clay-Silica-Ca. Carbonate	4	$(4–15.67)^2/15.67=$ 8.691059349	8	$(8–12.78)^2/12.78=$ 1.787824726
Clay-Ca. Carbonate	0	$(0–15.67)^2/15.67=$ 15.67	2	$(2–12.78)^2/12.78=$ 9.092989045
Ca. Carbonate-Mg. Carbonate	2	$(2–15.67)^2/15.67=$ 11.925264837	1	$(1–12.78)^2/12.78=$ 10.858247261
Mg. Carbonate	2	$(2–15.67)^2/15.67=$ 11.925264837	4	$(4–12.78)^2/12.78=$ 6.031956182
Total	141	267.52	115	114.99
Significance level 0.001 Critical value = 26.12		√		√

Degrees of freedom = 8

To determine whether this is the case will require excavation of these sites, with particular regard given to sources of palaeoenvironmental data. Domestic sites (see Figure 21) would have required access to soil types suitable for arable farming, given their dependence on agriculture. Most settlements occur on clay–silica based soils,

Figure 21: Site type by soil mineralogy



otherwise known as loam, dependent on the level of silt present. Whilst the presence of silica can be a negative factor at high levels, fertile soils require the presence of both silica and clay; the clay provides a counterpoint to the free draining nature of the sand. The calcium carbonate, clay and silica variants, depending on levels, can also produce loamy soils. Such loamy soils would have good agricultural potential, whilst those with a particularly high silica content, combined with a high altitude location, would be poor for arable farming. In terms of the secondary elements, including magnesium and calcium, these are present in the various soils of the region. Clays can also provide an assortment of nutrients necessary for healthy plant growth. Those sites on silica based soils tend to relate to higher altitudes and may have been utilised seasonally for grazing or when brown earths prevailed upon clearance of the post glacial woodland coverage for arable farming. Hardy breeds of sheep or cattle may have overwintered on the mountains, particularly in mild years. The presence of feral goats and horses in parts of upland Wales indicate that this was possible, although they will move to lower altitudes in inclement weather.

Soil structure and matrix

Rather than relying on dominant mineralogy, soil groups give a more complete picture of the prevailing soil type in any given locale. These soil types are on a range that will reflect the prevailing soil conditions (see Appendix C). Nonetheless, caution must be exercised as soils reflect the prevailing climatic conditions, parent material, vegetational coverage and anthropogenic influences, such as that associated with contemporary improved pastureland. However, that being said, both hillforts and domestic sites are predominantly located on soils of a medium type, whether sandy, clayey or silty.

Soil structure consists of a mixture of particle sizes, which gives soil structure, and the preponderance of a given size sets the overall structure. A crumb structure of c. 3 – 6 mm consisting of silica, clay and silt provides the best ratio of air, water and nutrients (O'Hare 1988, 15 – 16). The colder temperatures and wet conditions found at altitude can lead to eluviation and, ultimately, podzolic soils, where an iron pan forms; gleying may also be present, see Chapter 2.

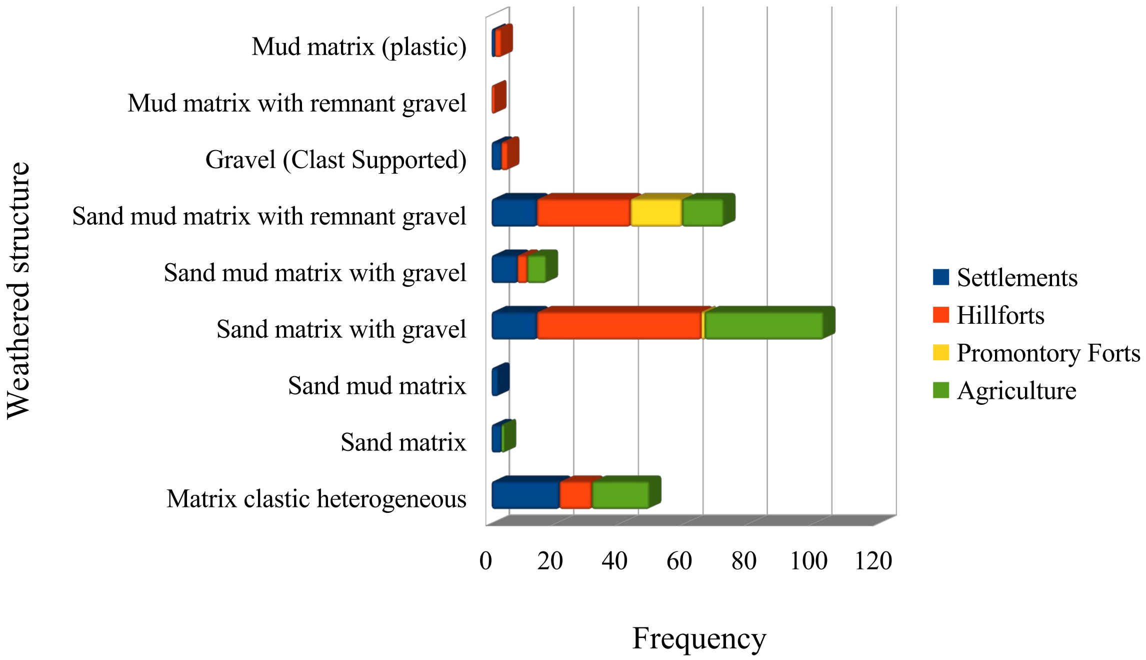
Plough or ard marks are typical of all subsoils, for example, clay, sand and loam, and are thought to indicate multiple ploughing and sometimes cross-ploughing. These marks have only been replicated when things have gone disastrously wrong, though, such as the ard tip being buried whilst ploughing, but some examples of prehistoric rock art do show the ard tip at a very steep angle (Reynolds 1995, 179). It is also possible that a different type of implement made the marks, such as the hook plough used in Galicia, Spain, during the 20th century AD for clearing uncultivated ground (Reynolds 1995, 179). This type of plough leaves marks between 2 and 4 m in length, similar in appearance to ard marks. These marks would coincide with the maximum length cattle could pull before it necessitated clearing of plant debris.

As seen in Table 5 and Figure 22, gravel, sands and heterogeneous matrices within the weathered matrix of the various soils demonstrate vividly glaciation's significant impact on the region. The most significant categories are those with a sand and sand mud matrix, with varying proportions of gravel, and the matrix clastic heterogeneous. These soils would have been relatively easy to work and, when combined with other favourable factors, such as a relatively low altitude and incline, would probably have combined been during late prehistory. However, these soils may have constituted brown earth in later prehistory. However, they may have reverted to the underlying matrix due to soil erosion caused by farming and soil exposed to the weather due to woodland clearance.

Table 5: Site type by soil structure (weathered).

Weathered matrix	**Settlements**	**Hillforts**	**Promontory Forts**	**Agriculture**
Matrix clastic heterogeneous	21	10		18
Sand matrix	3			1
Sand mud matrix	2			
Sand matrix with gravel	14	51	1	37
Sand mud matrix with gravel	8	3		6
Sand mud matrix with remnant gravel	14	29	16	13
Gravel (Clast Supported)	3	2		
Mud matrix with remnant gravel		1		
Mud matrix (plastic)	1	2		

Figure 22: Site type by soil matrix



The two hypotheses are:

Null Hypothesis: There is no association between soil texture and site location.

Alternative Hypothesis: There is an association between soil texture and site location beyond that which might be expected by random variation.

The critical value of 29.59, at the 0.001 significance level (i.e. 99.9% confidence level), was exceeded by the test statistic of 173.92 and 80.75 for settlements/agriculture and hillforts/promontory forts, respectively (see Table 6) as such, the null hypothesis can be rejected in both cases. Therefore, there would appear to be a correlation between sites and soil texture. However, as previously iterated, this statistic should be caveated because other factors may account for this distribution. There does, however, appear to be a preponderance of sites to be located on Medium to light (silty) to heavy soils, which account for 34.12% of the region's soils or variants at the medium level of the soil texture spectrum (see Figure 23 and 24). The Medium to light (silty) to heavy soils is a broad category encompassing a wide range of potential soil textures.

Table 6: Sites by soil texture.

Soil Texture	**Settlements and agriculture**	$\frac{(O-E)^2}{E}$	**Hillforts and promontory forts**	$\frac{(O-E)^2}{E}$
All	4	$(4–2.82)^2/12.82=$ 6.068049922	1	$(1–0.36)^2/10.36=$ 8.456525097
Heavy	2	$(2–12.82)^2/12.82=$ 9.13201248	0	$(0–10.36)^2/10.36=$ 10.36
Heavy to medium to light (silty)	4	$(4–2.82)^2/12.82=$ 6.068049922	3	$(3–10.36)^2/10.36=$ 5.228725869
Light to medium	6	$(6–12.82)^2/12.82=$ 3.628112324	9	$(9–0.36)^2/10.36=$ 0.178532819
Light (sandy) to medium (sandy)	22	$(22-12.82)^2/12.82=$ 6.57351014	18	$(18–10.36)^2/10.36=$ 5.634131274
Light (silty) to medium (silty)	10	$(10–12.82)^2/12.82=$ 0.620312012	9	$(9–10.36)^2/10.36=$ 0.178532819
Light (silty) to medium (silty) to heavy	11	$(11–2.82)^2/12.82=$ 0.258377535	12	$(12–10.36)^2/10.36=$ 0.2596139
Medium to light (silty)	2	$(2–12.82)^2/12.82=$ 9.13201248	7	$(7–0.36)^2/10.36=$ 1.08972973
Medium to light (silty) to heavy	54	$(54–12.82)^2/12.82=$ 132.277098284	23	$(23–10.36)^2/10.36=$ 15.421776062
Medium (silty) to light (silty)	12	$(12–12.82)^2/12.82=$ 0.052449298	4	$(4–10.36)^2/10.36=$ 3.904401544
Medium (silty) to light (silty) to heavy	14	$(14–2.82)^2/12.82=$ 0.108611544	28	$(28–10.36)^2/10.36=$ 30.035675676
Null			1	
Total	141	173.92	114	80.75
Significance level 0.001 Critical value= 29.59		√		√

Degrees of freedom = 10

Figure 23: The region's soil texture in percentage terms

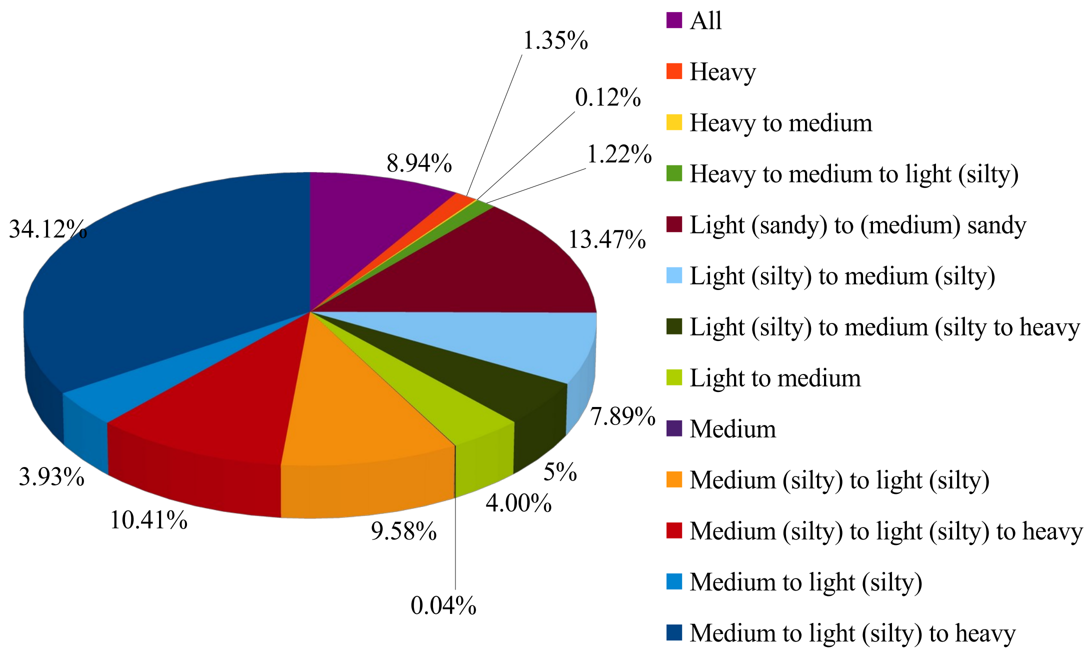
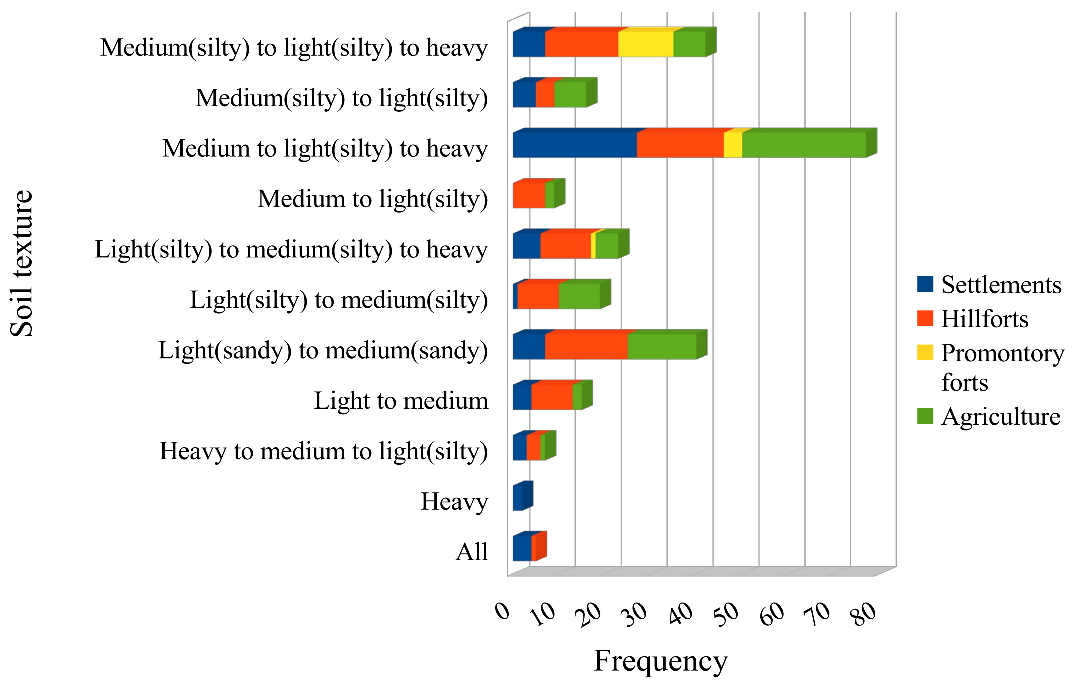


Figure 24: Site type by soil texture



For a pastorally based economy such heavy, albeit on a range, soils would not have been an issue. However, considering the accepted views, this would appear counter-intuitive for arable farming. There is evidence to the contrary for ploughing on clayey soils on the southern side of the Severn (Bell *et al.* 2013, 7). Given the proximity to the region, there should be no reason why such soils were not being ploughed here, and technologically speaking, this should not have constituted a problem. Many sites also fall within the light to medium or medium to light ranges, reflecting their differing proportions. Though medium and heavy soils would be more challenging to plough, they would have an advantage over lighter sandy soils because they would be less prone to drying out.

Aspect

Aspect is frequently ignored as one of the parameters of site selection. A southerly aspect will warm up far quicker than that with a northerly aspect, which can be subject to shading. Such a southerly aspect will enable the earlier germination of crops, which may give sufficient edge to allow for crops otherwise unsuited to the area. During the hottest part of the day, the sun is in the west; as such, a west facing slope will be warmer than an easterly one. Those with a southern aspect are more likely to bear the brunt of the prevailing southwesterlies that this area experiences though. Settlements are usually located on relatively level ground or platforms or terracing constructed for settlements, on the simple premise that people require a level place to live. Aspect was calculated from the HER point data initially, due to the absence of any polygons. However, as polygons were generated for hillforts, aspect was subsequently generated from the inner polygons produced.

The two hypotheses are:

Null Hypothesis: There is no association between aspect and site location.

Alternative Hypothesis: There is an association between aspect and site location beyond that which might be expected by random variation.

Table 7: Site type by aspect.

Slope Aspect	**Settlements and agriculture**	$\frac{(O - E)^2}{E}$	**Hillforts and promontory forts**	$\frac{(O - E)^2}{E}$
N	17	$(17–17)^2/17=$ 0	15	$(15–14.125)^2/14.125=$ 0.05420354
NE	13	$(13–17)^2/17=$ 0.941176471	11	$(11-14.125)^2/14.125=$ 0.691371681
E	18	$(18–17)^2/17=$ 0.058823529	5	$(5–14.125^2/14.125=$ 5.894911504
SE	17	$(17–17)^2/17=$ 0	19	$(19-14.125)^2/14.125=$ 1.682522124
S	28	$(28–17)^2/17=$ 7.117647059	20	$(20-14.125)^2/14.125=$ 2.443584071
SW	21	$(21–17)^2/17=$ 0.941176471	19	$(19–14.125)^2/14.125=$ 1.682522124
W	13	$(13–17)^2/17=$ 0.941176471	8	$(8–14.125)^2/14.125=$ 2.655973451
NW	9	$(9–17)^2/17=$ 3.764705882	16	$(16–14.125)^2/14.125=$ 0.248893805
Null	5		2	
Total	136	13.76	113	15.35
Significance level 0.01 Critical value =18.48		×		×
Significance level 0.05 Critical value = 14.07		×		√
Significance level 0.1 Critical value = 12.02		√		√

Degrees of freedom = 7

The calculated chi-square statistic was 13.76 and 15.35 for settlements/agriculture and hillforts/promontory forts, respectively (see Table 7). Only at the 0.05 significance level, 95% confidence level, could the null hypothesis be rejected for hillforts and promontory forts. It took until the 0.1 significance level, i.e. 90% confidence level, for this to be the case for agriculture and settlements. The 95% threshold and above confidence levels are usually considered significant by statisticians and, therefore, used. Given the absence of evidence for settlements, however, this result should be considered with caution. Additionally, there was reliance on point data, which might not accurately reflect the overall aspect of a site due to the absence of area data. The HER data also appears to be significantly under-representative of what the actual settlement levels for the region should be. Notwithstanding this, most sites are located between a southeasterly aspect through to a southwesterly one, accounting for 52% of all sites (see Figures 25 and 26). If this is extended to include those sites with an east and west aspect, it accounts for 74% of all sites. The solar gain would have been maximised for those sites, broadly speaking, with a southerly aspect providing a more conducive environment for occupation.

It should be noted that such trends may not be explained by simple functionalist explanations. That said, there seemed to be no cosmological bias towards the southeast as seen in roundhouse entrances, albeit in Wessex (Sharples 2010, 199). The doorway of a roundhouse may frame the necessary vista, whilst something other than the site's aspect may reflect this cosmological framework. In part, this could be masked by sites of differing periods being grouped together. For example (Oswald 1997, 91), Bronze Age roundhouses trend towards a more southerly orientation, including a southerly aspect in terms of the sites' overall location. More specifically, Sharples (2010, 200 – 1) observes a southerly orientation for entrances in the Middle Bronze Age that is more pronounced than that for the later Iron Age, although the overall trend is southeasterly for prehistory as a whole.

The number of hillforts with a broad northerly, particularly that of the northwest, aspect may indicate that other factors were at play that were more important than the apparent optimum aspect (see Figures 25 and 26). Such factors could have been to emphasise monumentality and prominence, and that their aspect was ideally suited for the purpose

Figure 25: Site type plotted by aspect (cardinal and inter-cardinal points)

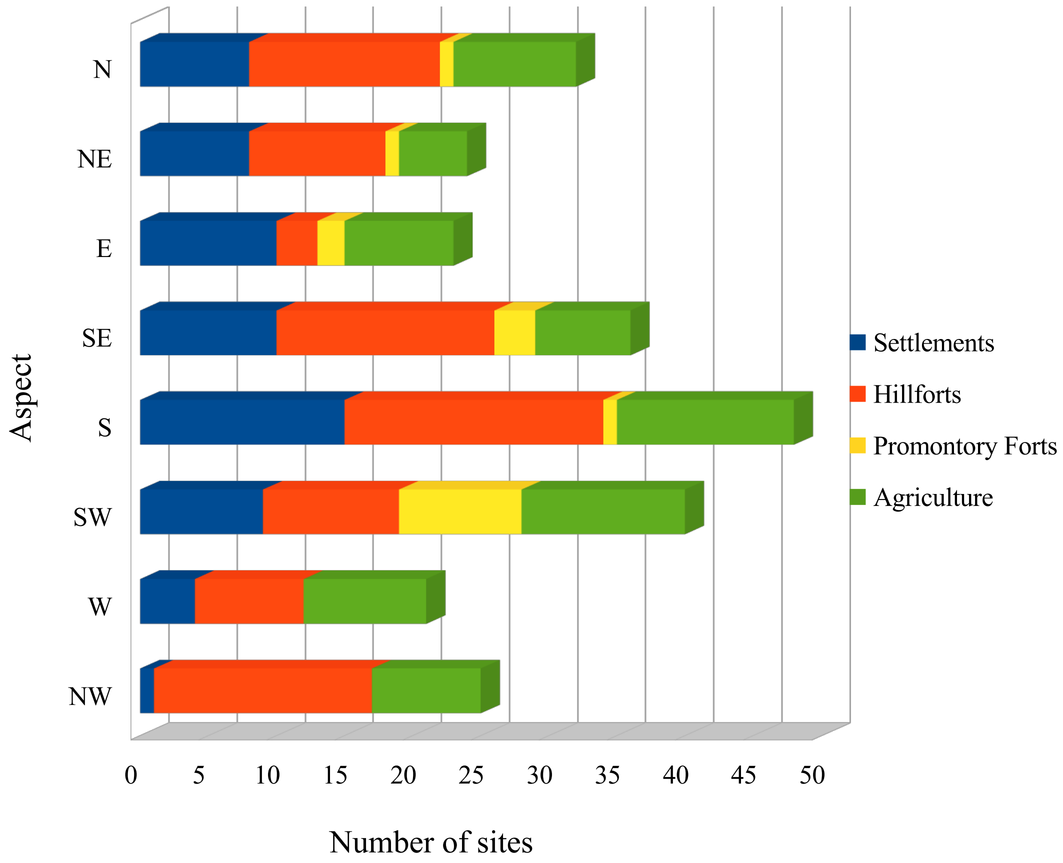
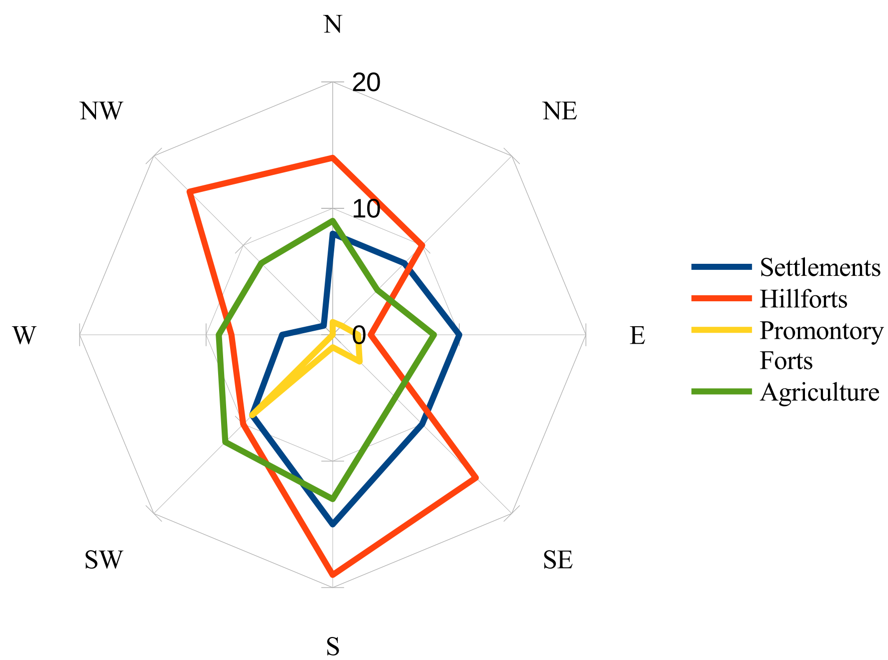


Figure 26: Aspect by site type within the region, by cardinal and inter-cardinal points



intended, whatever it may be. Promontory forts have a predominantly southwesterly focus, although this probably has more to do with the topography of sites along the coast. It would have presented a bleak visage in the winter, albeit the coastline has probably altered over the passage of several millennia. Some of these forts may also have been seasonally occupied to allow for the exploitation of their liminal locations. They should, however, be seen in the context of the Bristol Channel not being a barrier, but as a means of facilitating travel with all its associated aspects, including trade, fishing, etc.

Several sites returned a null value, primarily because they were immediately adjacent to the region's periphery or were subject to quarrying, such as Mynydd Twm. One such site on the region's periphery was Craig-Y-Ddinas, which occupies a promontory on the very periphery of the region. Its location is ideally placed to draw upon the resources of the adjacent valley bottoms and the high mountain for grazing. Furthermore, it would have been an influential position at the northern end of the Neath Valley. Outside the region, in Powys, following the Neath Valley northwards into the Brecon Beacons is a further hillfort, Gelli Nedd (CPAT 70159), in what was Brecknockshire. The positioning of these hillforts adjacent to the Roman road Sarn Helen cannot be one of coincidence.

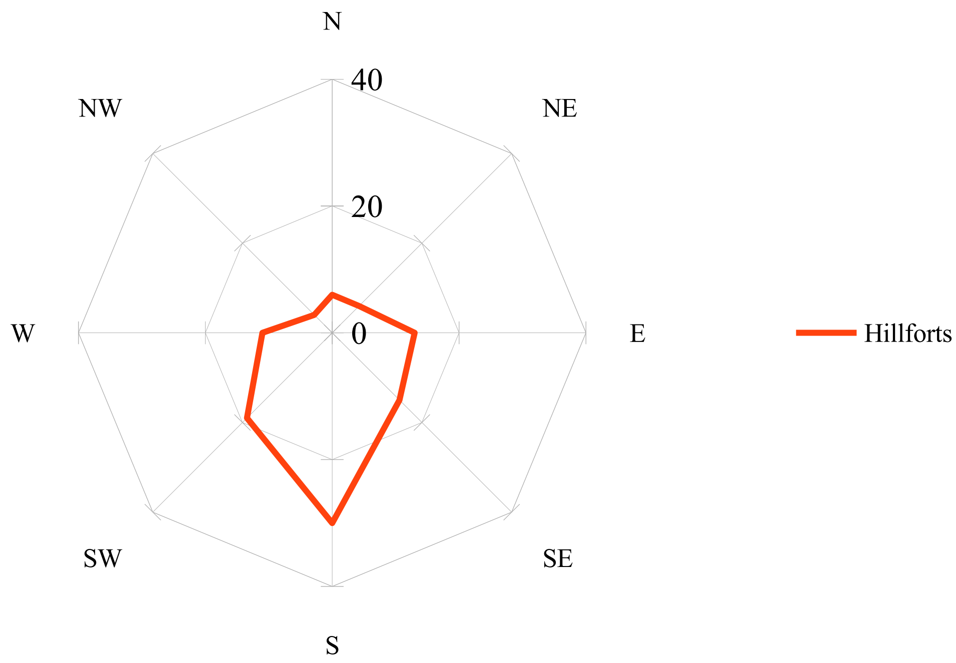
As with all geographical parameters, if the availability of a suitable location were exceeded, alternatives would have been sought. Different geographical features may also be predominant in the study area, such as a broadly southerly aspect, which in other regions may have featured less strongly. Within the Coalfield area, the valleys are orientated north-south and break up the plateau area; this would have had a significant impact on the availability of locations for sites. Furthermore, to the north of the region, a significant proportion of the slopes have a northerly aspect, such as that to the north of Gelli Gaer Common.

Given that polygons had been generated for the area enclosed by the innermost boundary of the hillforts within the region, it was determined that these would be ideal for generating a mean aspect for the individual hillforts (see Figure 27). Particularly so when one considers that the above was reliant on point data, which may not reflect a hillfort's overall aspect. What becomes evident is the shift towards a broad southerly aspect with 61.5%, up from 52% for point data, of hillforts having an aspect falling between southeasterly to southwesterly. Of those hillforts with a northerly aspect:

- Mynydd Y Gaer (Gaer Fawr) Lower Camp whose prevailing aspect is northwards towards the southern end of the Neath Valley and is located within the southern coastal margins of the region.
- Llwynheiernin Enclosure located between the Neath and Swansea valleys at their southern end, again in the coastal strip.
- Hen Gastell (Dan Y Lan Camp) on the northern coast of the Gower with an aspect towards the Loughor Estuary.

The choice of these locations may have had more to do with the proximity of significant routes in later prehistory than their desirability for residential occupation.

Figure 27: Aspect of hillforts and promontory forts within the region, by cardinal and inter-cardinal points



Conclusion

The ubiquity of water in the region and where it may have been absent, solutions readily available, would indicate that it was not a limiting factor. Conversely, being too close to a watercourse could be a liability in a flood event. Assumptions about the location of sites near watercourses on valley sides and, in doing so, 'dominating' them for their stock seem implausible. Such a premise relies on the presumption that the people here were pastoralists and that water was in such demand that it had to be dominated. In reality, the farmers were probably engaged in some form of mixed farming, albeit the emphasis would have been more towards pastoralism at altitude due to the marginality of the environment here.

Altitude appears to have been significant for the siting of hillforts, as Brown (2019, 33) observes c. 89% of all hillforts in England and Wales are located below 300 m in altitude, whereas for the region, this figure is 91.3%, which appears to corroborate Brown's findings. It would, therefore, appear that the focus for hillforts was generally lower altitudes, and the bulk, c. 82%, are located below 200 m in altitude in the region. Whatever their role, it was linked with an altitude generally below 200 m, where presumably most of the population also lived. If one looks at those hillforts located above this, such as those at the Vale of Ewyas, their role may have differed from those at a lower altitude. In the central Black Mountains and valleys, hillforts are mainly absent, although there are a number on the northern periphery in what was once Brecknockshire. These hillforts would have had a different raison d'être than their, relatively speaking, lowland counterparts, such as exerting influence over routes into Brecknockshire.

The strong presence of agriculture at altitude, in all likelihood, reflects the nature of the evidence, i.e. clearance cairns, rather than intensity which in the process have created a cultural landscape. Between 450 and 550 m, there are no settlements present, but given the exposed nature of the landscape, this should not be surprising when temperatures here are up to c. 4 °C lower than that of the region's coastal areas. However, this does not preclude seasonal grazing at either end of the altitude scale. In Figure 19, there appears to be an absence of probable data for settlements between 150 and 300 m altitude, whereas hillforts follow a steadier decline that one would also expect settlements to follow.

The analysis shows a correlation between sites and soil texture in that sites tend to be located on Medium to light (silty) to heavy soils, accounting for 34.12% of the region's soils (see Figure 22). Followed by variants at the medium level of the soil texture spectrum, such soils would retain moisture far better than one towards the siliceous end of the spectrum and, therefore, require less watering. Regarding soil mineralogy, there is a preponderance of clay-silica and silica. Those sites on silica may be indicative of the presence of leaching, combined with high rainfall, on an acid parent rock, such as sandstone. Their formative causation would be the clearance of the climax vegetation, i.e. woodland, and subsequent exposure of the soil.

A southerly aspect would be beneficial, but this does not appear to have been the sole concern of later prehistoric people, as evidenced by the results. There appears, however, to have been a general preference for those with a broadly southerly aspect, as evidenced by the results produced from hillforts' polygons. Such a preponderance for a southerly aspect may also apply for settlements, but the absence of evidence makes this difficult to demonstrate. Furthermore, there may be a cultural reason for the selection of a southerly aspect for such sites in prehistory. Of all the of the various elements statistically tested, aspect appeared to have the least significance and may reflect the need for a broadly level area for occupation.

Chapter 8: Hillforts: the analysis

Introduction

This chapter presents the analyses of hillforts in terms of their size, distribution, altitude, geographical separation and visibility. Nearest neighbour and k-means were utilised to identify potential groupings or clusters in the region that may have resulted for many reasons. Least cost paths (LCPs) were generated to assist in understanding the movement of later prehistoric peoples through this landscape and how they may have 'read' it. This movement of people through the landscape and how it then relates to hillforts is vital to our understanding of their role. It then, in turn, allowed for an understanding of how the wider landscape was structured/organised within the geographical context of southeast Wales during later prehistory and what functions hillforts may have performed in the region.

A more holistic approach not ensconced in the ritual/functional dichotomy may provide a deeper understanding of later prehistoric society. The aim is to strike a balance from that of a position of 'detached objectivism' and 'situated subjectivity' (Lock, Kormann and Pouncett 2014, 23). These positions were, however, considered when modelling visibility and movement; they are also equally applicable to other approaches to interpreting later prehistoric landscapes.

Hillfort distribution by size and altitude

To the north and west of the region, smaller hillforts start to dominate, and, within the region itself, there is a dearth of any hillforts in the South Wales Coalfield. This absence, in contrast with the south of the region, could reflect the lower level of the land's overall carrying capacity. There are, however, a few exceptions to this, such as Carn Caca (GGAT 00564w), in the Vale of Neath and Maendy Camp (GGAT 00040m), Rhondda Fawr. Hillforts were plotted by their maximum extent and the area enclosed by the innermost boundaries. The innermost boundary was selected for calculating a hillfort's area, as this is the area is usually quoted by writers on the subject. However, the maximum extent could indicate a site's monumentality, particularly when combined with a hillfort's location and boundaries.

In southeast Wales, there are 111 hillforts (see Figures 28 and 29) for which areas were extracted, including promontory forts of varying sizes. As the contemporaneity of these hillforts is still being determined, it makes it difficult to draw conclusive arguments from the data. In Wales, the hillforts between 1.2 and 6 ha in extent or even larger at 6 ha plus, are restricted to the Welsh Marches, coastal margins and areas below 244 m in altitude, indicating a hillforts' role was primarily linked to the agriculturally more fertile lowland areas. However, this should not preclude other associations for hillforts, particularly those within the region's upland and coalfield areas.

Within the former county of Glamorgan, it has been reported that 84% of hillforts here are less than 1.3 ha in extent and just 15 sites are over 2.5 ha (Davis and Sharples 2020, 166). Should the areas calculated for the hillforts' innermost boundaries be utilised for calculating the enclosed area, the percentage returned is 87% (65). However, the areas generated in the writing of this thesis indicate the presence of a smaller number of hillforts enclosing more than 2.5 ha in Glamorgan, at 10, than that reported. These departures from that reported by Davis and Sharples (2020, 166) may be accounted for, at least in part, by the dataset utilised and how the areas used were calculated. For example,

1. Reference is made to Twm Barlwm as a hillfort in Glamorgan when it is in fact in Gwent.
2. The hillforts' areas, such as Beech Court, Ewenny could not be calculated.
3. Where the inner boundary is taken from, i.e. central point or front/rear extent of the boundaries.
4. Difference of interpretation over what constitutes a hillfort or is not included in the Atlas.

Figure 28: Southeast Wales: hillfort's area plotted by maximum extent

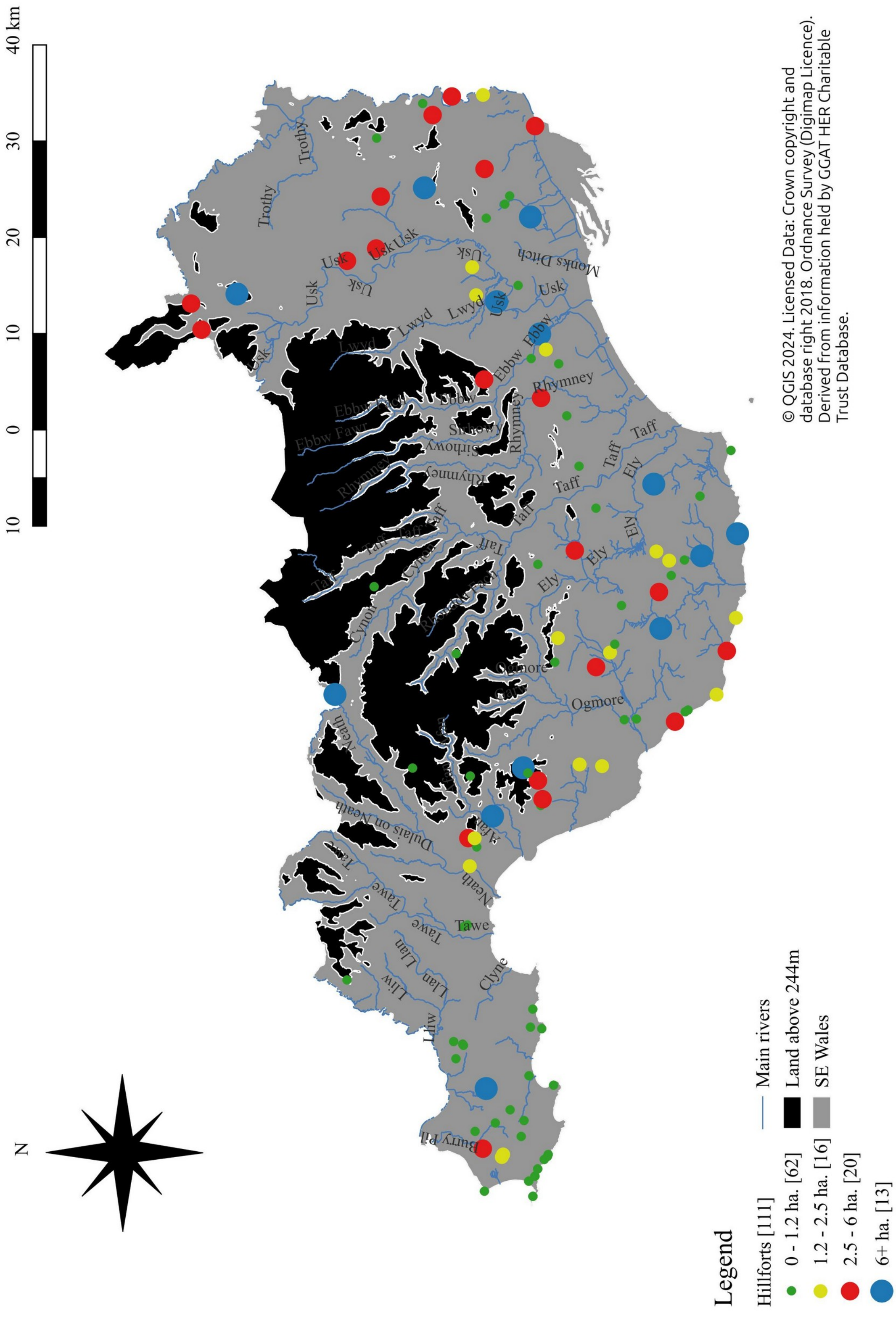
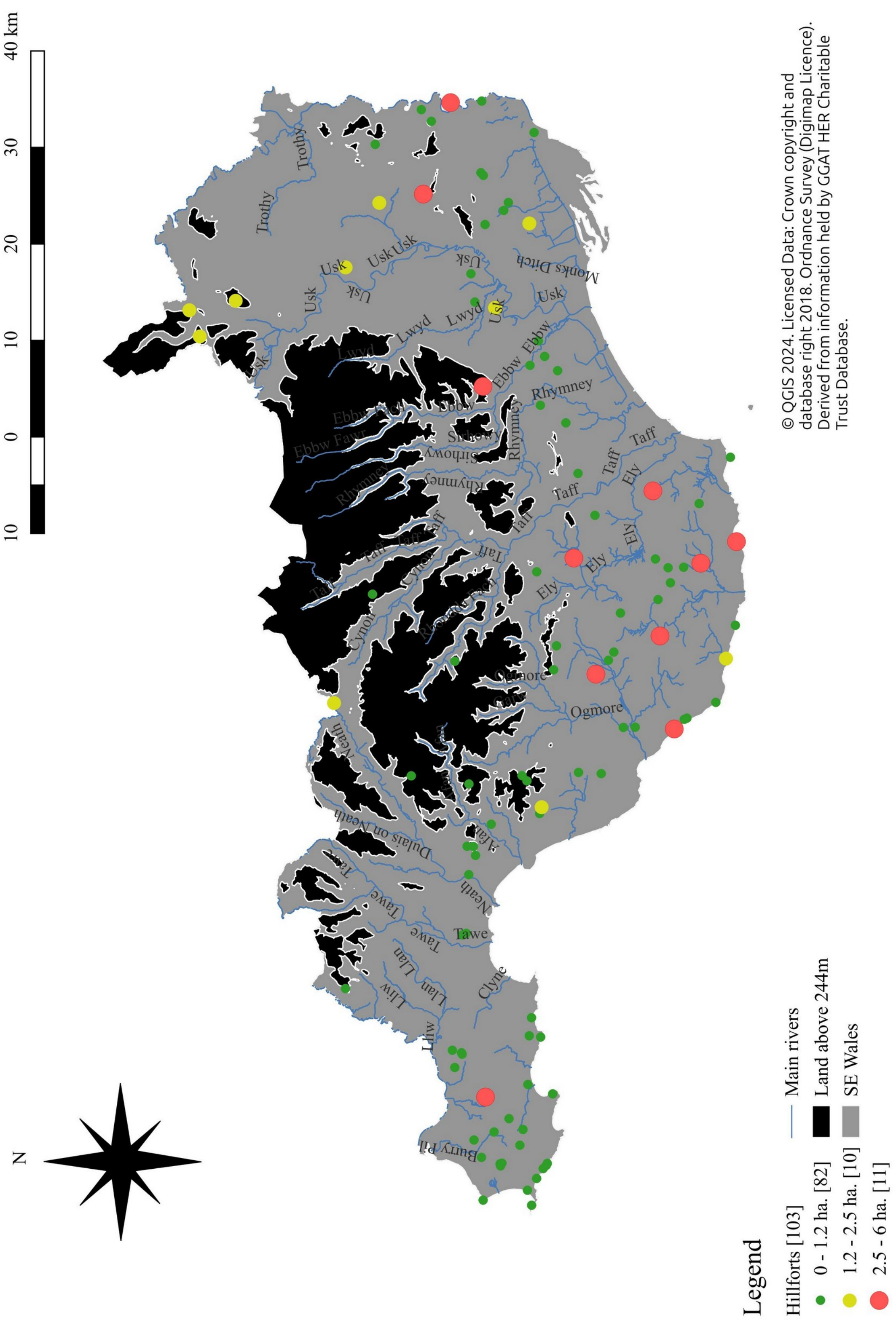


Figure 29: Southeast Wales: hillfort’s area plotted by the area enclosed by the innermost boundaries



For southeast Wales, as a whole, c. 44% of hillforts enclose an area over 1.2 ha. The majority of hillforts, therefore, fall below 1.2 ha, though unlike those of southwest Wales, the disparity is somewhat less pronounced in favour of smaller hillforts.

Lancaster (2014, 6), observes that for Gwent, most hillforts, where the size is known, are less than 1.2 ha in size. From the areas produced, it would appear that those hillforts below 1.2 are indeed the more prolific, at 17 in total. It should be noted that an almost equal number of hillforts exceed 1.2 ha in Glamorgan and Gwent at 10 and 11 hillforts, respectively. As a proportion of the hillforts in their respective counties, this is greater for Gwent and may, tentatively, relate to the proximity of the larger hillforts in the Marches. In Wales, as a whole, those hillforts that do not exceed 1.21 ha account for 75% of confirmed sites (Brown 2019, 33).

Jackson (1999, 202) observes a disparity in the size of hillforts between Gwent and its adjoining English counties. In that, the hillforts of Gloucestershire and Herefordshire tend to be larger, but given the disparities already highlighted, it is uncertain whether this would stand up to closer scrutiny. However, Britnell and Silvester (2018) observe the clustering of hillforts over 6 ha in the English border counties within the catchment of the rivers Wye and Severn. Silvester (Britnell and Silvester 2018) expands on this by opining that it is not due to the absence of smaller hillforts in the west of Herefordshire, but simply that the larger hillforts are more evident. Given the definitions applied by Cadw to several potential hillforts, such as enclosure and enclosure (defensive), for example, Danish Fort, Sully Island (GGAT 00582s) and Gaer Hill Camp, Monmouthshire (GGAT 00745g) respectively leads to a degree of confusion here. These differences in approach between the HER and Cadw may also be reflected in England. The definition of the Atlas was adopted to avoid such confusion, as discussed previously.

Multivallate hillforts, from 1.2 to 2.9 ha, have been observed to appear within their own ‘zone’ demarcated by the rivers Wye, Usk and Monnow, and it has been proposed that the area had different cultural traditions from that of adjacent areas within the Marches (Jackson 1999, 104). Jackson’s (1999) focus was, nonetheless, primarily on the Welsh

Marches and, as such, the entirety of Gwent does not fall within its remit. One of the reasons for defining this sub-regional group was mainly due to the absence of Droitwich briquetage, associated with the distribution of salt, within the sub-region. Twenty-six fragments of Droitwich briquetage were found during the excavation of the Lodge Wood Camp in 2000 though (Pollard *et al.* 2006, 6 and 37 – 38). Lodge Wood Camp (GGAT 00597g) is to the northwest of the river Usk. Given its proximity to the hillforts immediately to the east of the Usk and its internal size, c. 1.63 ha (maximum extent approximately 6.15 ha), it should be considered contextually in association with these hillforts. Particularly so as the absence of Droitwich briquetage was one of the determining factors for its exclusion.

Davis and Sharples (2020, 166) also consider that the larger hillforts of Glamorgan should be considered within the context of a supra-regional grouping that includes Gwent and the Marches. Given the hillforts' location and size within southeast Wales, such a proposal seems plausible. This view is borne out by the fact that there is a greater concentration of larger hillforts, as a proportion of all hillforts, in Gwent than Glamorgan. The reason for this may relate to the proximity of larger hillforts in the Marches; compared with Glamorgan, at c. 63.3%, Gwent has only c. 35.3% of hillforts with areas not exceeding 1.3 ha.

On Gower, it has been asserted that the hillforts have more in common with those of Dyfed, a region that encompasses Cardiganshire, Carmarthenshire and Pembrokeshire, based on size when compared with those to the east of the region (*ibid.*). Given the presence of the Loughor Estuary, which separates Gower from Carmarthenshire, Gower is best placed within southeast Wales or considered a separate entity. The existence of such a significant geographical barrier to communication should not be underestimated, with its attendant treacherous sands and fast tides within the body of the estuary. In the 19th century, the lowest bridging point was at Pontarddulais, some 11.27 km (7 miles) north of Gower.

There are also 23 hillforts of less than 1.3 ha on Gower. It could be argued that these are more akin to enclosed settlements. What is notable on Gower is the absence of hillforts within the 2.5 – 6 ha category and the number of smaller hillforts. Given the relatively small area which Gower comprises and the number of hillforts present, it is surprising that Murray (2016, 356) should describe it as an area of low density with reference to the number of hillforts. The associated distribution map would indicate that approximately 42% of the area is of a high density in terms of the concentration of hillforts, whilst the remainder of Gower is of a medium (high) density (*ibid.*). The Bulwark (GGAT 00029w), Llanmadoc Hill, which encompasses an area of c. 0.87 ha in extent could be indicative of a trend towards decreasing hillfort size the further westwards one progresses. This general decline in size may represent a shift in socioeconomic practices or the changing carrying capacity of the land.

In order to understand how the landscape was structured, it is necessary to determine the distributional factors of elements of later prehistoric society, in this case, hillforts. The initial approach is to look at the broader factors, such as distribution and altitude. Hillforts appear to be largely absent above 244 m OD, and those in this core upland area are generally below 1.2 ha in extent. Conversely, most of the region's hillforts are within the coastal margins of the region; it would, therefore, indicate that hillforts are not a significant feature of the upland areas of southeast Wales.

Cluster analysis

The perceived clusters of hillforts in southeast Wales, considered representative of clan groupings by Lancaster (2014, 6 and 33 – 7), were subject to nearest neighbour and k-means statistical analyses to test this hypothesis. As already observed, Davis (2017, 329) has argued that issues of contemporaneity, form variability and interrelationship of different types of settlement, i.e. enclosed and open, leave the premise open to question. The following analysis addresses these shortcomings, at least in part, by subjecting the data to cluster analysis and giving the identified clusters a geographical context. Identifying the nature of hillfort distribution, clustered, random or regular, and whether any broader clusters are present allows for the development of a narrative to explain the existence of these clusters and how the region may have been subdivided vis-à-vis in terms of hillforts. Such analysis will assist in our understanding of how the landscape was structured/organised within southeast Wales during later prehistory and the role of hillforts within the region. Clustering is indicative of the local distribution of resources, communities or regional centres (Roberts, 2003, 15 – 37; and Bevan and Conolly 2006, 218).

The first application of the test was based on all hillforts, whilst the second was with the outliers to the north removed.

Nearest neighbour

Nearest neighbour results range from zero (highly clustered) to 1.00 (random distribution) through to just over 2.00 (even distribution). Initially, the statistic was run with all available hillforts and promontory forts included. The following results were obtained from this approach:

Results:

Observed mean distance: 2382.69

Expected mean distance: 3693.11

Nearest neighbour index: 0.65

Number of points: 119

Z-Score: -7.41

The nearest neighbour index of 0.65 indicates a tendency towards a clustered distribution, and the Z-score appears to corroborate this for the distribution of hillforts within the region. This result would seem to support the presence of resource catchments within the region, given that there is a propensity towards clustering. Site catchments are based on the concept that resources are distant dependent and that the catchment size would depend on the deemed value of a given resource (Maschner 1996, 7).

The hillforts to the north of the region, 8 in total (blue points on Figure 30), were removed from the nearest neighbour analysis, and included:

- Ysgyryd Fawr (GGAT 01497g)
- Twyn Y Gaer (GGAT 01713g)
- Pen Twyn (GGAT 01607g)
- Craig Y Dinas (GGAT 01107m)
- Glyn Neath (GGAT 00551w)
- Gwersyll Enclosure (GGAT 00483m)
- Castell Morlais (GGAT 00831m)
- Graig Fawr (GGAT 00345w)

as they appear to form part of another group to the north and are some 7.5 miles from the more coherent, from this study's perspective, group to the south. The north of Gwent and the interface between the Coalfield and Brecon Beacons appear to belong to a separate group of hillforts with its focus somewhere to the north. Earlier writers appear to have given little consideration to the region's geography when drawing conclusions about the distribution and nature of hillforts.

Results:

Observed mean distance: 2261.85

Expected mean distance: 3452.66

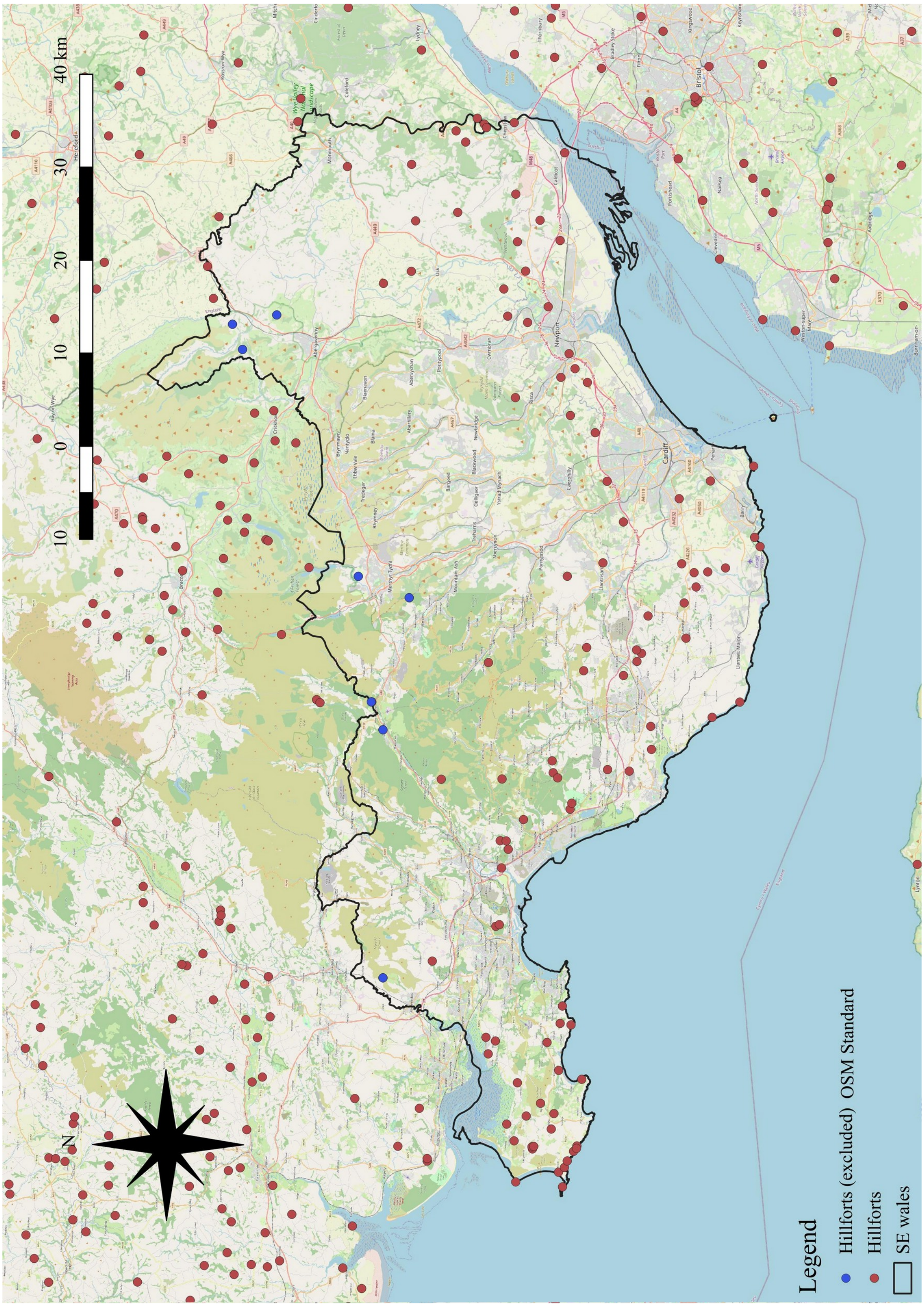
Nearest neighbour index: 0.66

Number of points: 111

Z-Score: -6.95

The nearest neighbour index of 0.66 indicates clustering again, and the Z-score corroborates a tendency towards a clustered distribution pattern in southeast Wales. The data selection for this run of the nearest neighbour statistic is more appropriate for the reasons detailed above, and removing the outliers increases the level of clustering, as measured by nearest neighbour and the Z-Score. This would suggest that hillforts and promontory forts were clustered in the landscape for some purpose associated, potentially, with the land's carrying capacity. Clustering or nucleation has also been said

Figure 30: Hillforts of southeast Wales and its hinterland



to occur due to the localised distribution of resources, spatial representation of polities or the presence of regional centres (Roberts, 2003, 15 – 37; and Bevan and Conolly 2006, 218). It is considered that a regular or uniform distribution, assuming contemporaneity, is indicative of competitive interactions, catchments or the presence of both scenarios (Bevan and Conolly 2006, 218, and Hodder and Orton, 1976, 54 – 85). The random position is often viewed as the position of the null hypothesis in statistical terms, but this need not be true in all cases (Bevan and Conolly 2006, 218). Whilst the presence of clustering seems to bear out Lancaster's (2014, 4) assertion that the settlement pattern observed indicates "… a decentralised political and social structure." with subgroups distributed throughout southeast Wales.

K-means

Given that the nearest neighbour statistic has identified a trend towards clustering, k-means was utilised to identify these clusters. Clustering is indicative of the local distribution of resources, a communities spatial extent or regional centres (Roberts, 2003, 15 – 37; and Bevan and Conolly 2006, 218). Given that hillforts and promontory forts did not exist in isolation and would have existed on a continuum, which constituted part of the social and domestic fabric of later prehistory, it was necessary to determine how they functioned as groups. As such, k-means was run at four different cluster levels, i.e. 3, 4, 5 and 6, to identify the optimum cluster level. Caution must be exercised when relying on these results, as the absence of the inclusion of sites from neighbouring regions/clusters may have distorted the results, i.e. edge effects. However, geographically discrete areas, such as a peninsula like Gower, would in all likelihood give an accurate representation, as would be the case for those areas remote from the region's periphery.

Identifying the appropriate cluster level may show how southeast Wales was broken up into 'territories' in later prehistory and how they may have interacted within a decentralised structure.

The k-means statistic at the three cluster level (see Figure 31), generated the following:

1. Cluster (2) of 32 hillforts broadly covers Gwent, including the mouth of the Vale of Ewyas, and, to the west of the Rhymney, including Craig Ruppera (GGAT 01672m). The three hillforts centred around the mouth of the Vale of Ewyas are best placed within a cluster outside of the southeast Wales region, to the north into Brecknockshire and England to the east, given their separation from the main body of the cluster to the south. For example, to the east is Waterstone Camp, Herefordshire, and to the northwest, either side of the Usk Valley. Those along the upper reaches of the Usk Valley include, on the west side, Coed Pen-Twyn (CPAT 3342), Pen Ffawyddog Gaer (CPAT 81) and Penmyarth Camp (CPAT 664), whilst on the east side are Llangenny Camp (CPAT 695) and Crug Hywel (CPAT 1057). As one progresses northwards up the Usk, there appears to be a cluster of hillforts over a wide area to the north of Brecon.

2. From the eastern side of the Taff, Castle Field (GGAT 00627s), to the eastern bank of the river Afan in the south and Neath in the north, is a further cluster (3) of 51 hillforts. To the northern end of the Neath Valley and the upper reaches of the river Taff are four hillforts, which, given their proximity to the well-known Brecon cluster to the north and separation from the main body of the cluster to the south, would probably best be placed within the Brecknockshire cluster.

3. A cluster (1), including Gower, extends towards the area between Neath and Afan rivers; this cluster includes 36 hillforts. However, this extends beyond the main body of Gower cluster as encompassed by the rivers Clyne, Lliw and Llan. Warren Hill, Briton Ferry; Craig Ty Isaf, Buarth Y Gaer; and Mynydd Y Gaer, Lower Camp (GGAT 00804w, 00652w, 679w and 651w, respectively) are probably more appropriately included in cluster 2.

The k-means statistic at the four cluster level (see Figure 32) generated the following:

1. The Gwent cluster (2) is unchanged at this iteration.

Figure 31: Three clusters specified, derived from hillforts, and identified by k-means

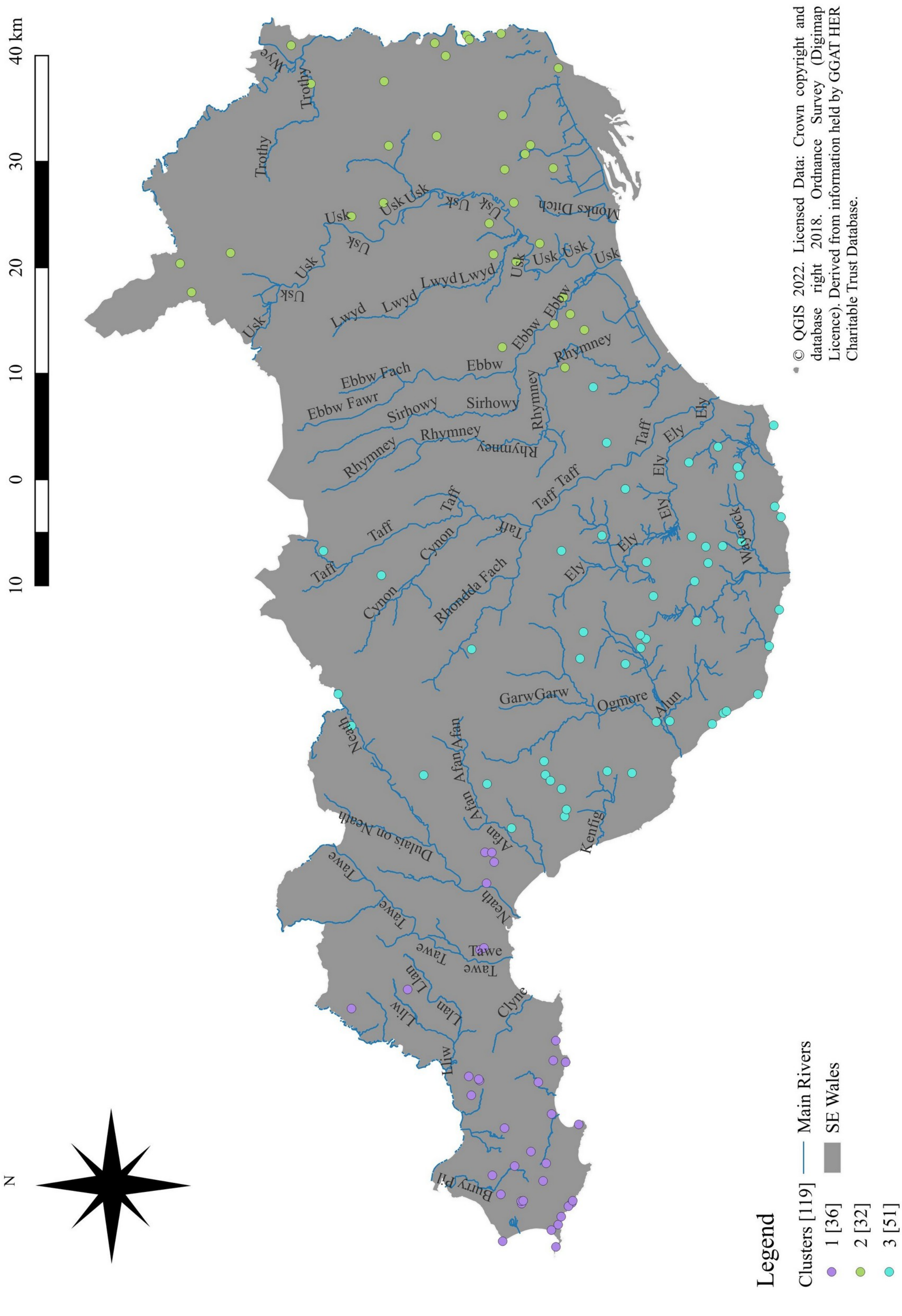
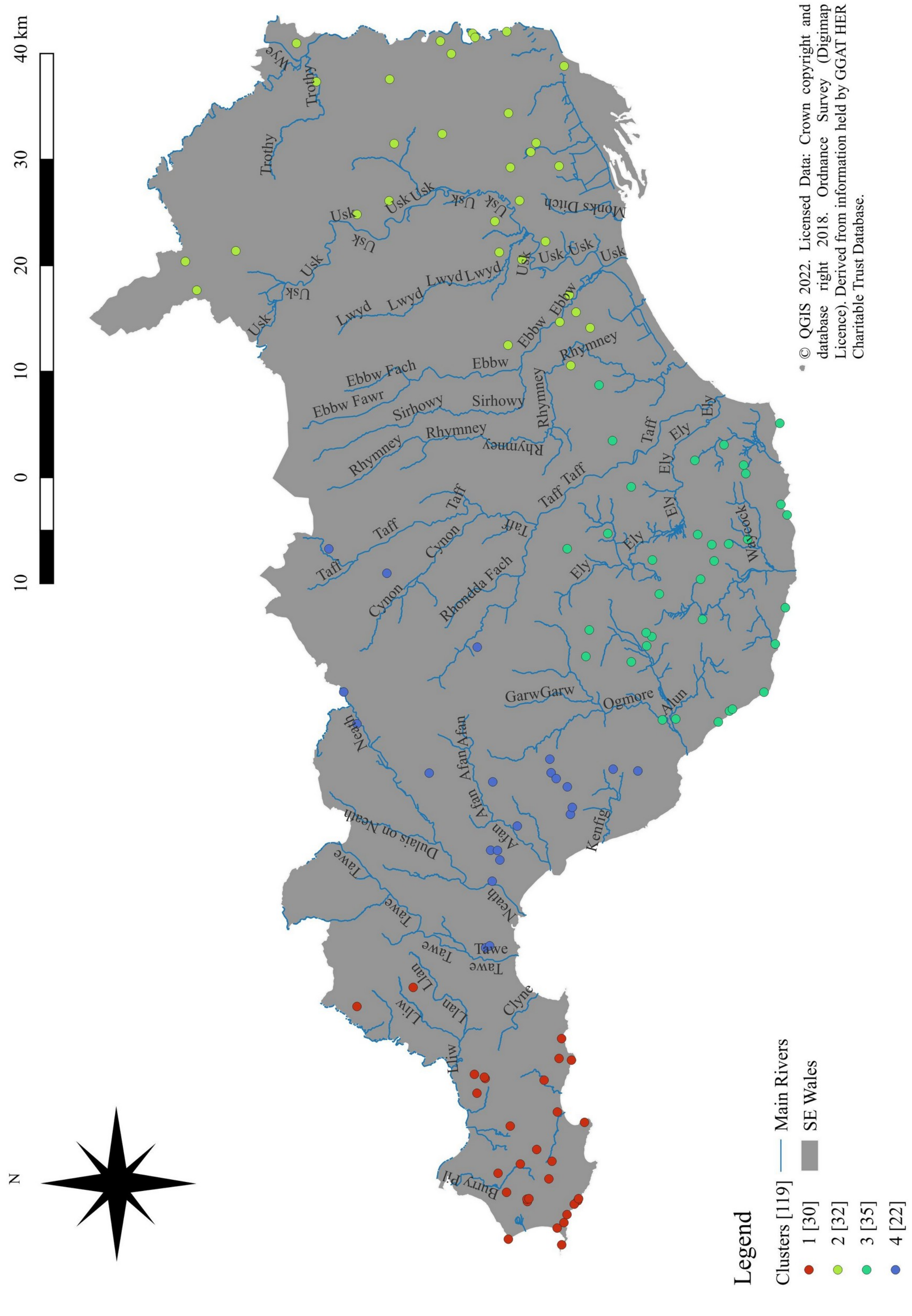


Figure 32: Four clusters specified, derived from hillforts, and identified by k-means



2. However, at the four cluster level, the “South Glamorgan” cluster (3) separates off from the rest of Glamorgan in the vicinity of the Ogmore and Ewenny rivers in the west.

3. Moving westwards into Mid Glamorgan is a cluster (4) of 22 hillforts bounded by the Tawe on its western edge.

4. Gower cluster (1) drops to 30 hillforts, and its spatial extent is reduced to the west bank of the Tawe between the third and fourth iterations of k-means. At this level, Gower appears more of a discrete entity from the rest of the region.

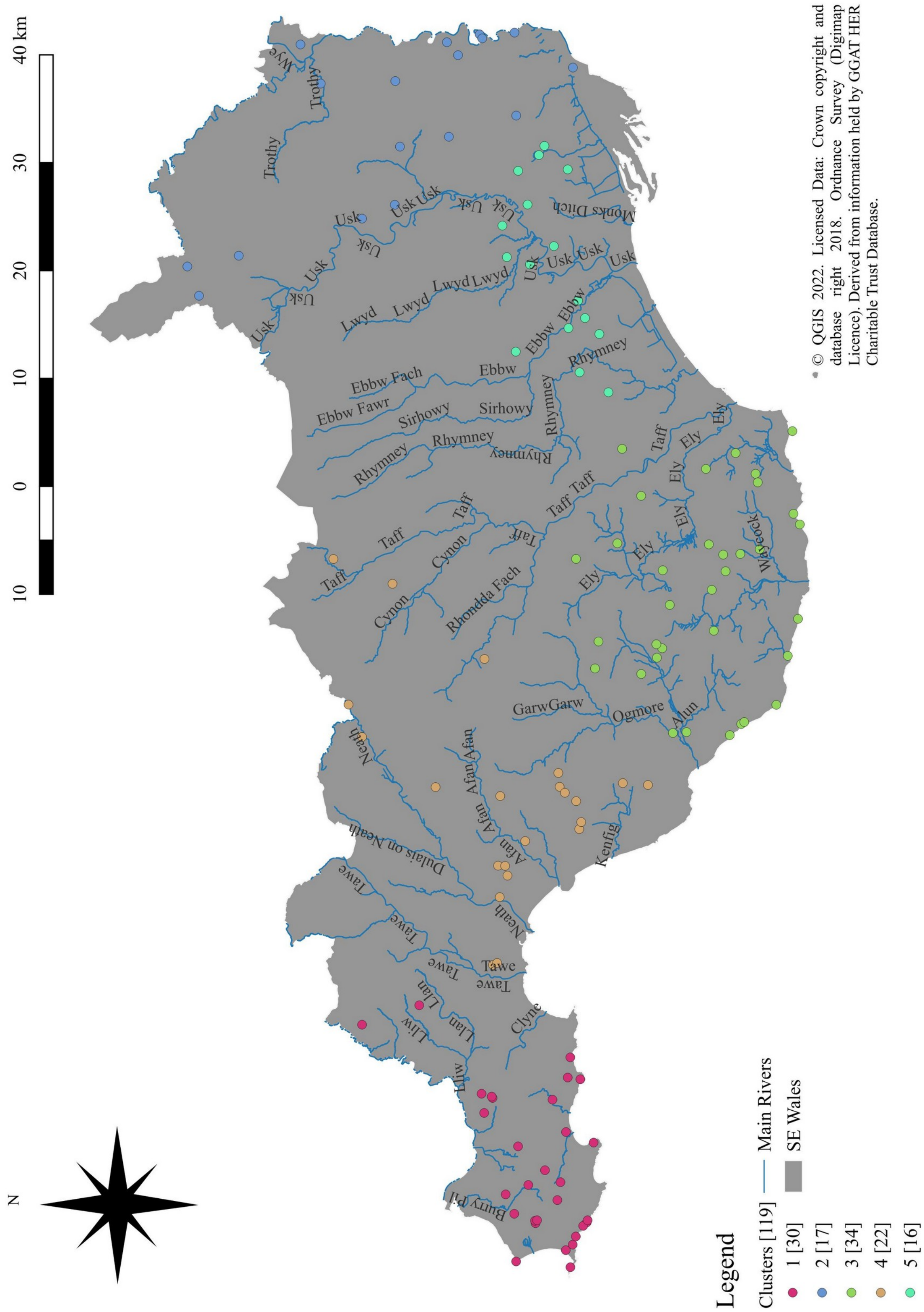
The k-means statistic at the five cluster level, the default setting for QGIS (see Figure 33), generated the following:

1. At this iteration, Gwent becomes split into two clusters comprising 17 (2) and 16 (5) hillforts, respectively. Llanmelin (GGAT 01026g (see Figure: 18) is considered by some to be potentially the former tribal capital of the Silures, given its proximity to Caerwent (Coflein, 2021). It falls right on the western periphery of a cluster extending up Gwent's eastern side. Its status is a matter of conjecture, given that the premise is primarily based on its proximity to the *civitas* of the Silures, Venta Silurum (Market of the Silures) though.

2. The westernmost of the Gwent cluster (5) extends as far west as Craig Ruperra and Castlefield (GGAT 01672m and 00627s, respectively) on the western side of the Rhymney River. The fact that this cluster and other clusters do not observe a river as a boundary may not be an issue, as it has been proposed that territories were based on river valleys rather than hillforts (Jackson 1999, 208; Millett 2007, 148 and 153; and Wallace and Mullen 2019, 32).

3. From Wenallt, on the eastern side of the Taff, in the east to Ty’n Y Waun in the west (GGAT 00604s and 00341m, respectively) is a further cluster (3) of 34 hillforts. This cluster broadly accords with the geographical extent of Cardiff and the Vale of Glamorgan.

Figure 33: Five clusters specified, derived from hillforts, and identified by k-means



4. A further cluster (4) was generated between the rivers Ogmore and Tawe, comprising 22 sites. This area also broadly speaking accords with the unitary authorities of Swansea (excluding Gower) and Neath Port Talbot. Additionally, at this iteration, the entirety of the Neath Valley falls within this cluster. The Ewenny acts as the county boundary between South Glamorgan and West Glamorgan, along with a short stretch of the Ogmore. The Ogmore forms a geographical boundary between clusters (3) and (4).

5. Gower forms a discrete cluster (1) of 30 hillforts, as demarcated by the rivers Lliw and Clyne.

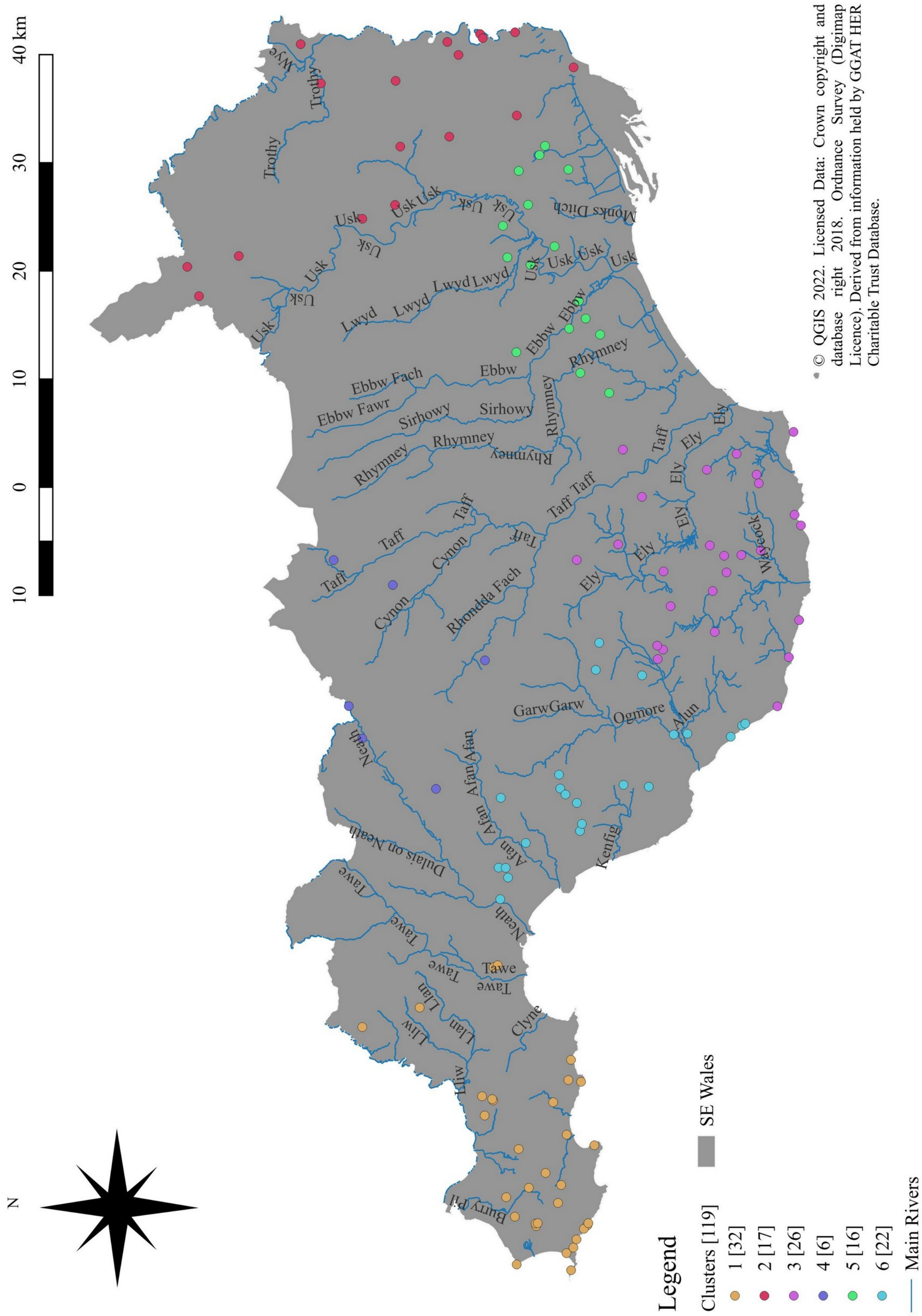
The k-means statistic at the six cluster level (see Figure 34) generated the following:

1. At this iteration of the statistic, a cluster of 6 hillforts (4) extends southwards in the area centred upon the northern reaches of the Neath and Taff. This cluster extends as far south as Maendy and Carn Caca (GGAT 00053m and 00564w, respectively). However, these two hillforts may be best incorporated into the adjoining cluster to the south, where, topographically speaking, they appear to be better placed. The northern extent of the Neath Valley may have been more marginal in terms of which cluster it belongs. However, given that Craig y Dinas has extensive views of the north, it would indicate a more significant association with the south than the north, reducing the cluster to the north to an area around the Taff Fawr Valley.

2. Between the 5 and 6 cluster levels generated by k-means, Carn Nicholas and Llwynheiernin (GGAT 00464w and 00451w, respectively) become incorporated into Gower's cluster.

Throughout the various iterations of the k-means algorithm, Gower retained a presence as a discrete entity from the rest of the region. A number of the clusters at the 3, 4 and 5 iterations extend to the north of the region, which seems unlikely due to the region's

Figure 34: Six clusters specified, derived from hillforts, and identified by k-means



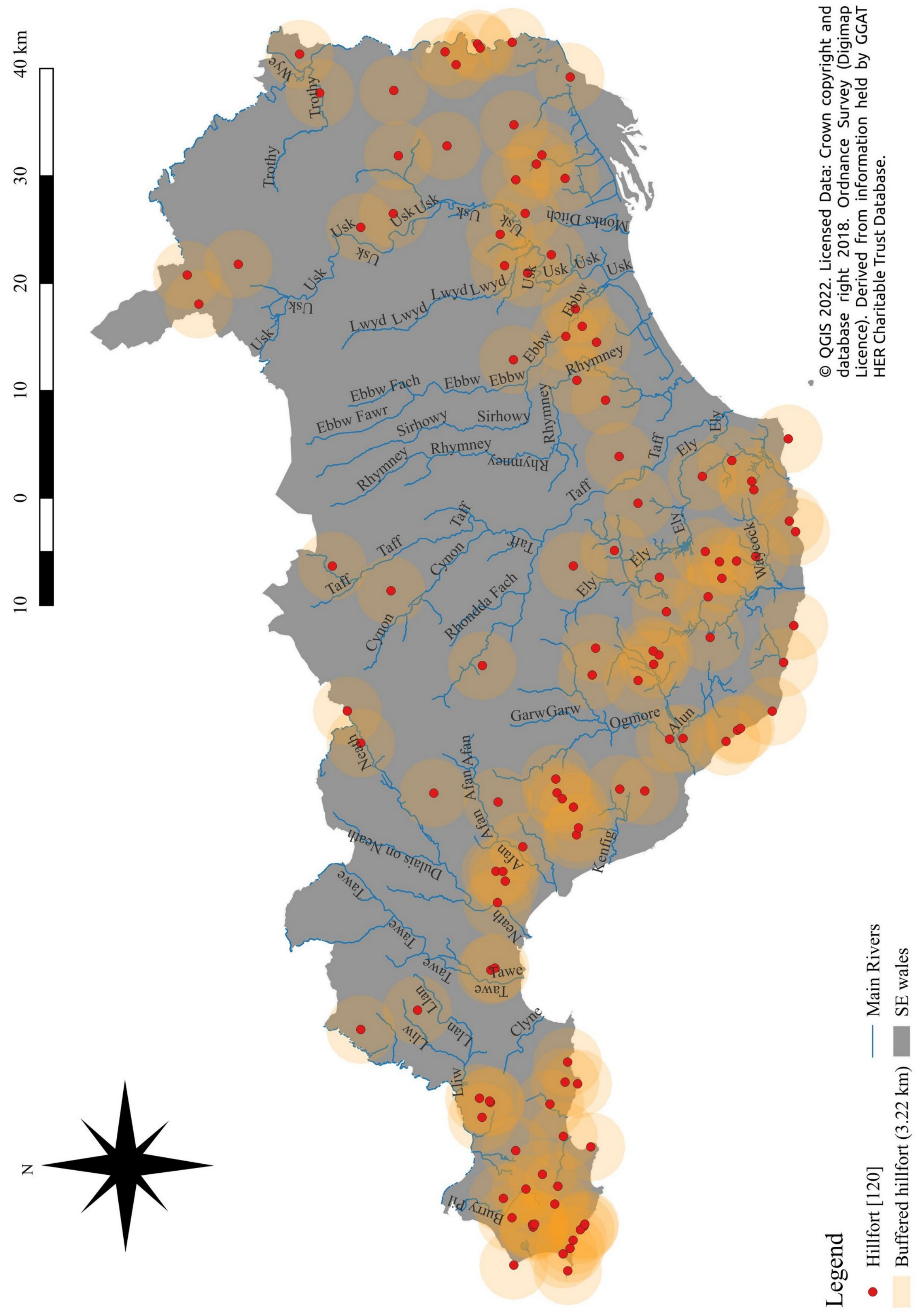
topography and the Brecknockshire cluster to the north. The coalfield, Brecon Beacons and Black Mountains present a significant topographic barrier. Tentatively, the hillfort cluster centred upon Llwyn-onn may have been accessed from the north, outside the region, around the Brecon area in Brecknockshire. Indeed, this area, presently within the region, originally constituted part of Brecknockshire. This proposition seems plausible given the area's remoteness, in terms of the southeast Wales region, and its proximity to Brecon. The Taff Fawr Valley, moving northwards until it becomes the Tarell Valley, provides a natural routeway through this area, as acknowledged by the presence of the A470. The hillforts of the Vale of Ewyas would also appear to be better placed within the Brecknockshire region or in Herefordshire, where parts of the Vale of Ewyas were incorporated into England.

Unlike the 12 'clan groupings' proposed by Lancaster (2016, 37), these clusters are significantly fewer, 3 or 4 (excluding those hillforts to the north), although Lancaster's were not generated by k-means. Lancaster, however, is unclear about how these 'clan groupings' have been created. As a discrete entity, Gower is probably the only element of commonality between these two approaches. Many of Lancaster's coastal 'clan groupings' have rivers at their centres rather than periphery. Inevitably, rivers will flow through a territory but can and do provide natural territorial markers delimiting the extent of a host area, which they seem not to do with those proposed by Lancaster. This is odd, given that Lancaster (2016, 38) acknowledges the importance of rivers in demarcating territory when he refers "… the Wye in the east, Loughor in the west and the Usk river valley in the north…" but rivers do not appear to act as boundaries in the model, as espoused by Lancaster.

Distance between hillforts (see Figure 35)

The first issue that needs to be addressed is scale, both analytical and phenomenological, which relates to measurement and experience, respectively (Lock *et al.* 2014, 24). This thesis aims to create a fusion between the quantitative and qualitative archaeological approaches, as both have their merits. From a phenomenological perspective, when setting scale parameters, such as what an individual could walk reasonably within an hour or two. Other features that would have had significance for

Figure 35: Southeast Wales: hillforts buffered at 3.22 km (c. 2 miles)



people are the culturally relevant features within the landscape, which all add to the experience of following a given route. A significant proportion of modern people are so estranged from the idea of walking for anything other than as a leisure activity that the idea of walking as part of one's daily life is often ignored.

Maschner (1996, 9) has observed that contemporary hunter and gatherer societies tend to utilise an area of land within 10 km (6.21 miles) from their base camp. However, for agriculturalists, this is halved to about 5 km (3.11 miles). This area would equate to Cunliffe's (2005, 30) 'zone of exploitation', which can supply a community with the food and materials it needs to survive. In terms of walking time, these distances would equate to approximately 2 hours and one hour walking time, respectively, although allowance would have to be made for the terrain traversed. These walking times are based on an average walking speed of just c. 4.83 km/h (3 mph), and it is entirely plausible that a prehistoric farmer would surpass this.

Jackson (1999, 88) more cautiously comments that agricultural communities have been shown to utilise land up to just a kilometre from the host settlement, with that land between 3 and 4km not meriting the effort of farming due to diminishing returns. In this conclusion, Jackson (1999, 88) cites work by Chisholm (1968, 49 – 51) that relied upon studies based on modern Finland and Sweden without analysing their respective geographies and technological levels. Given the technological status of both Sweden and Finland at the time of the study, the economic constraints on modern farming and the geography of the respective areas, it would indicate that one should be careful when applying this model without consideration being given to the appropriate applicable parameters for later prehistoric Wales. However, Jackson (1999, 88) used this to justify a catchment of just a 2 km (1.24 miles) radius for the hillforts in the Welsh Marches.

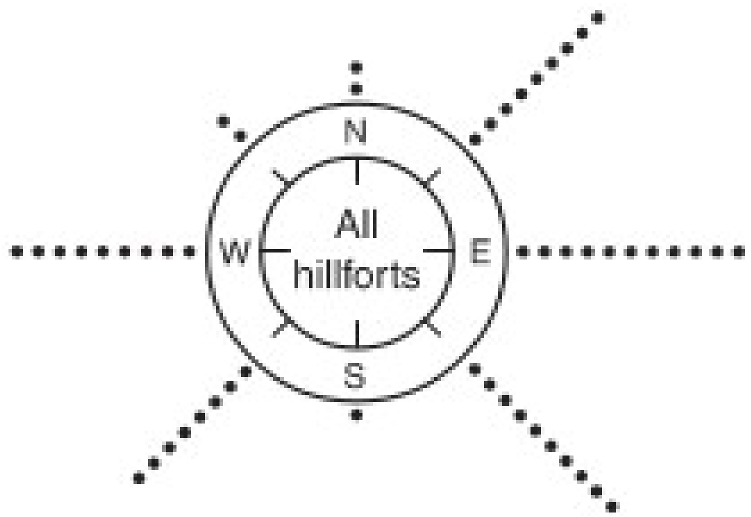
A compromise between the two positions (see Figure 35) is entirely reasonable at 3.22 km (2 miles), and, as such, the hillforts and promontory forts were buffered at 3.22 km (2 miles). This distance would also fall close to the expected mean distance generated by nearest neighbour for 111 hillforts at c. 3.5 km. The buffered areas should not be followed too rigidly, as terrain and economic draw factors would impact the desire to travel shorter or longer distances, such as spring grazing. The ability to travel long distances fairly rapidly, including commuting, has divorced many modern people from the idea of walking to work, which would have been common practice up until the mid-20th Century. The proximity, generally speaking, of the hillforts to one another meant that, in many cases, a half-hour walk was sufficient to complete the journey to a neighbouring hillfort. Walking at a steady c. 4.83 km/h (3 mph), it would take approximately, allowing for the impact of the terrain, 40 minutes to complete 3.22 km (c. 2 miles), although should a person walk at c. 8.05 km/h (5 mph) then the journey would take just 24 minutes. In this light, the region appears more interconnected than just a series of discrete, isolated points on a map, divorced from any context. It starts to become more coherent conceptually and spatially. For a person potentially occupying these hillforts, a relatively short walk would bring them to their neighbours.

Hillfort entrance orientation

A common feature of hillforts in the southeast of England is the western and eastern orientation of their entrances, which mirrors that of the entrances of dwellings and non-hillfort enclosures dating from the first millennium BC (Hamilton and Manley 2001, 11 (see Figure 36)). The region from which this evidential base was drawn, includes the Weald, Greensand Ridge, and the North and South Downs (*ibid.* 8).

It was not possible to determine the entrance orientation for a number (16) of the hillforts in southeast Wales, such as: Mynydd Twympathyddaer (GGAT00153m) that had been destroyed by quarrying; Castell Morlais due to the presence of a mediaeval castle, which may have destroyed an entrance; and many were simply not discernible from the 2 m DTM, probably due to soil erosion and/or ploughing. One would have considered that a promontory forts entrance may have been largely governed by the orientation of the coastline, but this did not seem to be the case, as witnessed at Lewes Castle promontory fort. Here it would appear that an appropriate topographical feature was selected, a headland, to fulfil the desired requirements in terms of orientation. This did not apply in all cases, for example Crawley Rocks promontory fort (GGAT00280w) with its northwestern entrance alignment. In terms of selecting entrance orientation,

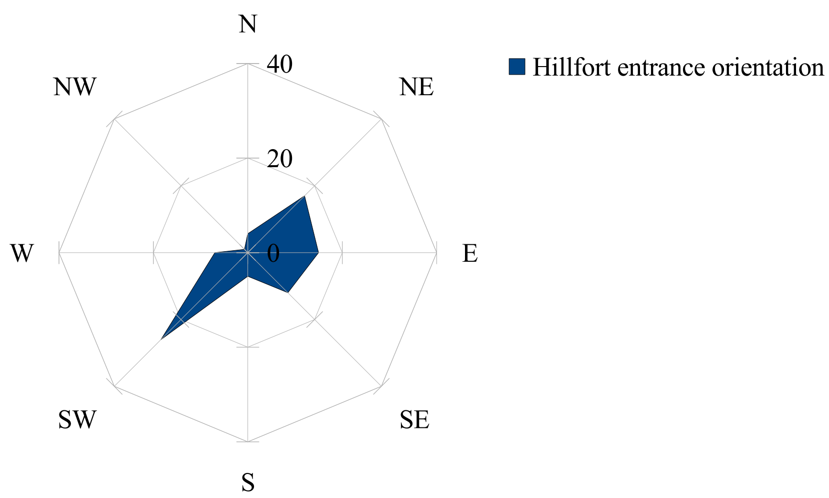
Figure 36: Entrance orientation for hillforts of southeast England.



Total 52 entrances

(Source Hamilton and Manley 2001, 12)

Figure 37: Entrance orientation for hillforts and promontory forts for southeast Wales.



Total 94 entrances.

sometimes the topography appears to have been considered to be an aligning factor when combined with the adjacent earthworks.

Unlike their counterparts in the southeast of England, southeast Wales has more of a southwest (23) to northeast/east (16 and 12 respectively) alignment (see Figures 36 and 37). Also notable was the minimal presence of those hillforts with a northwesterly (4) orientation and a low occurrence of northerly (7) and southerly entrances (10). When all hillforts from the southeast of England are considered, a similar trend appears to that in southeast Wales, in that there is only minimal representation for northerly entrances (2), northwestern (2) and the south (1). Broadly speaking, the southeast of England has a greater preponderance than southeast Wales in terms of the number of hillforts with an entrance with a westerly orientation (9), compared to just seven for southeast Wales, given that for southeast Wales, there are approximately 45% more entrances. What we may be witnessing with these entrance orientations could be another aspect of ‘morphological directionality’. Such 'morphological directionality' is the means by which an observer’s attention is brought to bear on specific aspects of a hillfort’s features, including the disproportionate vallation of the boundaries and entrances (Murray 2019, 117). Interestingly, this coincides with roundhouse entrance orientation, i.e. south to east orientation, which was prevalent during the Late Bronze Age and Early Iron Age in Wales (Ghey *et al*. 2007).

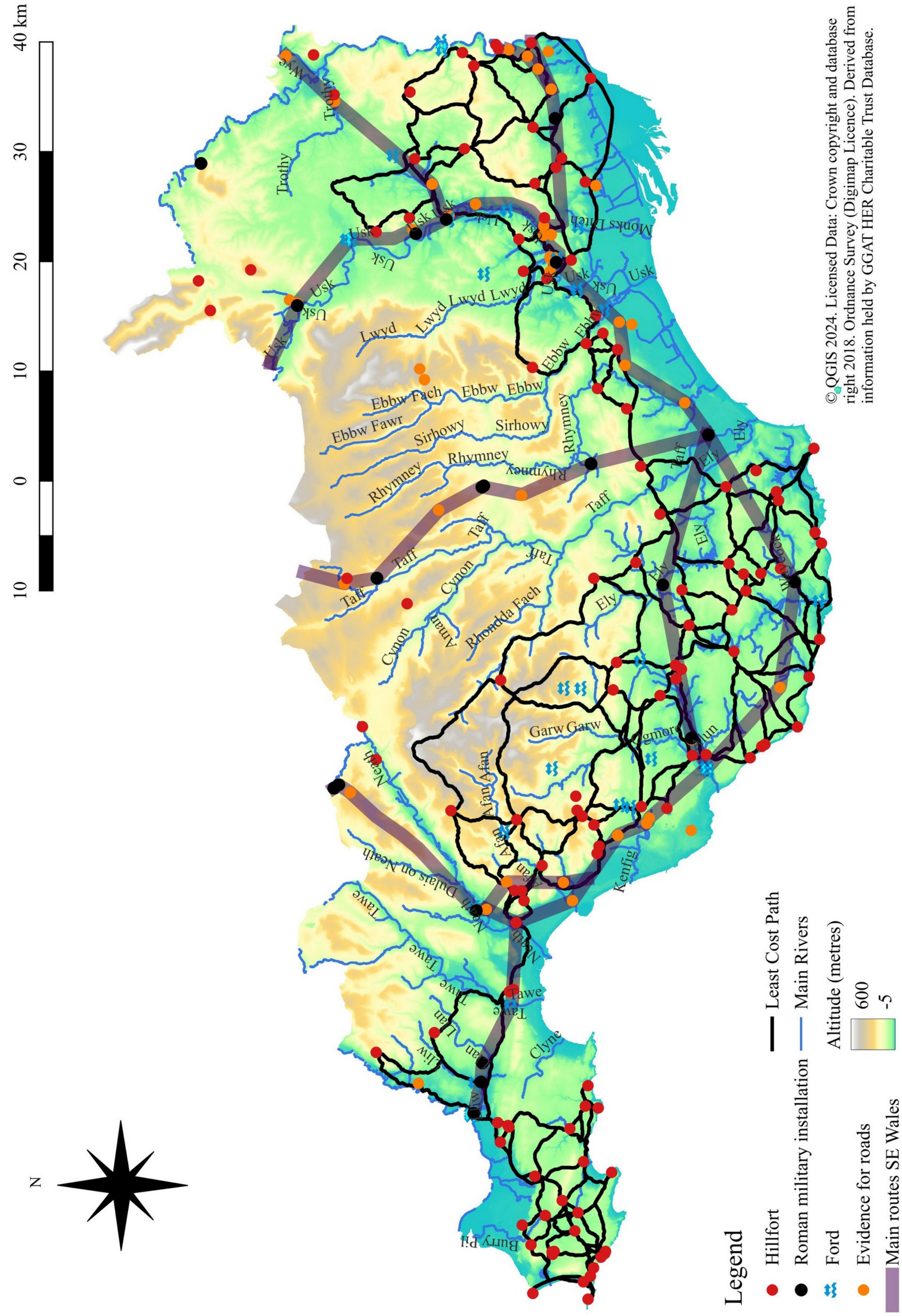
Gwent's reported entrance orientation for defended enclosures (Wiggins 2006, 16) shows a similar propensity for avoiding the north and northwest orientations, and the northeast not featuring so strongly. Hamilton and Manley (2001, 11) interpret this as a potential manifestation of “…over-arching `macro' cosmologies…” impacting hillfort placement and structure. This position is not without its critics, though, and there is a danger of reinforcing an already entrenched ritual/functional dichotomy, albeit regarding roundhouses and reiterating perceived factoids (Pope 2007, 205). The absence of a chronology for southeast Wales, unlike that for southeast England, makes a detailed comparison rather difficult.

Least cost paths (LCPs)

Cunliffe (2005, 293) observes that the north-south flowing rivers in the coastal margins of the region made communication difficult between the resulting blocks but does not consider the use of fords. People are social animals, which was no less so in later prehistory than today. Groups or individuals would want to meet for purely social reasons, including marriages, celebrations or other social events. From an economic perspective, stock markets or exchanges would have been necessary to maintain the genetic diversity of one's animals and prevent inbreeding. These meetings would have been essential for the cohesiveness of society in a given area and would help maintain the cultural identity of the area's people. As the hillforts to the north of the region appeared to have more in common with the group in Brecknockshire, it was determined not to include them when calculating LCPs, although there would have been links to those areas outside the region. Potential fording points that would have facilitated this movement of people to adjoining regions are thought to have existed at the Loughor, at Casllwchwr Isaf, possibly of Roman origin (GGAT 01779) and to the East, crossing the Wye, at Tintern (GGAT 00726g and 00743g). These locations may all have had later prehistoric antecedents, but no known evidence exists for such features in later prehistory. Relative to the land, lower sea levels may have reduced the tidal constraints of such crossing points in later prehistory compared to the present. Though with rising sea levels from c. 1500 BC sea levels, as observed by Darvill (2002, 75), such locations would have become increasingly subject to marine influences with higher tidal ranges.

LCPs were calculated between hillforts or promontory forts within the region (see Figure 38), with the view that they may indicate the routes taken by prehistoric peoples between neighbouring sites. In drawing these LCPs, the determining factors were that the LCP would be drawn to the nearest hillfort and, where there was an intervening substantial river, the LCP drawn would be between those hillforts closest to one another but on opposite sides of the river. As previously observed, it has been suggested that territories were based on river valleys instead of hillforts (Jackson 1999, 208; Millett 2007, 148 and 153; and Wallace and Mullen 2019, 32). A presence at the ridge route–stream interface was vital due to trade routes and communication (Wallace and Mullen 2019, 32). Analysing LCP routes may assist in discerning such routes and boundaries, if they existed, in southeast Wales. Interestingly, one of the clusters identified earlier

Figure 38: Least cost paths for hillforts and promontory forts of southeast Wales



appeared to utilise the Ogmore as its western boundary. Visually, the LCPs generated appear to generate three relatively discrete entities, corroborating the k-means findings. These coincide, broadly speaking, with Gwent, Glamorgan and 'Gower' extending inland.

A proxy indicator was adopted, Roman roads, for potential points of access and passage through the region (see Figure 38). As an occupying force an efficient means of movement would have been required, initially at least, to subjugate the local populace. Presumably, such roads would have utilised pre-existing routes where possible within the region, although the Romans may have rationalised the route in places to suit their own purposes. The routes exiting the region to the north are centred upon Brecon, acting as a hub, as is also the case for a number of other routes outside the region (Allen *et al.* 2018). The three North-South routes follow the Usk Valley, Rhymney/Taff valleys and run adjacent to the Neath Valley via Hir Fynydd (Sarn Helen), as opposed to the valley floor. These North-South arterial routes, centred on Brecon, effectively subdivide the region into four parts and indicate there significance for prehistoric peoples as well. East-west, the roads enter the region at Chepstow and Monmouth in the East, whilst in the West adjacent to Loughor Roman fort.

In Gwent, the Roman roads effectively enclose or fall close to the majority of hillforts thus allowing the occupying force to exert control over them. The Usk route aligns itself to a number of hillforts both within the region and northwards from Crickhowell, Brecknockshire. In the Vale of Glamorgan, the East-West network bifurcates into a coastal route and a more northerly one incorporating Miskin Roman fort; again, as with Gwent, this would allow the occupying Romans the ability to exploit the economy of the area and exert political influence on the area's populace. The southerly route passes close to Caerau hillfort down towards the coast, effectively segregating the Vales' promontory forts from the interior. Whilst in Neath Port Talbot, the Roman road largely separates this area's hillforts from their coastal margin. Moving further westwards, again Gower forms a discrete entity, as it is separated from the region by the East/West Roman road. Speculatively, this division may relate to one of control and the exploitation of rich fishing grounds along the coast. Around Neath a more southerly route is proposed, utilising Warren Hill and a ford over the Tawe, described in the HER as part of Roman road RR60 (Archwilio, 2024), although both routes are shown.

It was considered that potential fording points would be identified, as this would act as a 'pinch point' providing a focus for the LCP. The LCPs were plotted southwards from mid-Monmouthshire and then largely followed the coastal margins to, and including, Gower. It is worth highlighting that a site adjacent to an LCP need not indicate a causative association, particularly given the lack of evidence for contemporaneity. LCPs, however, should not just be considered in a purely functional sense but in a broader social context with associated 'cultural markers', such as monuments, set within the landscape (Lock *et al.* 2014, 24).

A narrative was developed by drawing on the geographical and cultural landscape features rather than just an algorithmically constrained route (*ibid.* 25). Such an approach will provide a more complete picture of the movement of later prehistoric peoples through and within the landscape of southeast Wales. One only has to think of giving directions to a stranger to an area and the sites that would be utilised as reference points, for example, public houses, religious establishments and parks, in directing them through the urban environment of a given town or city. These may have a different cultural meaning between the recipient of the directions and the person giving the directions, but should generally be mutually intelligible. To a later prehistoric person, this could be a hillfort, round barrow, megalithic tomb or significant natural features that would direct an individual's movement through the landscape and influence their experience.

Settlements tend to grow on or near river crossings, such as Cardiff, Newport and Swansea, in terms of the Taff, Usk and Tawe, respectively, within southeast Wales. These associations are not just limited to the region but are a common feature of settlement distribution. Within the region, the geological substrate manifests itself in east/west bands in the coastal margins, which would demarcate the distances from the coast for the fords. This geological substrate may result in the formation of shallow fording points upon rivers. Alternatively, they can form due to fluvial processes associated with the meandering of a river and, if this is the case, these riffles, i.e. a section of elevated river bed, may have moved accordingly. A number of hillforts or settlements (see Figure 39) appear in proximity to such riffles.

Figure 39: Potential fording point over the Usk, Newport

(Imagery date 28th May 2020) Location Lat' 51.638558° Long' -2.887409° (51°38′19″N, 002°53′15″W) © Google Earth Pro.

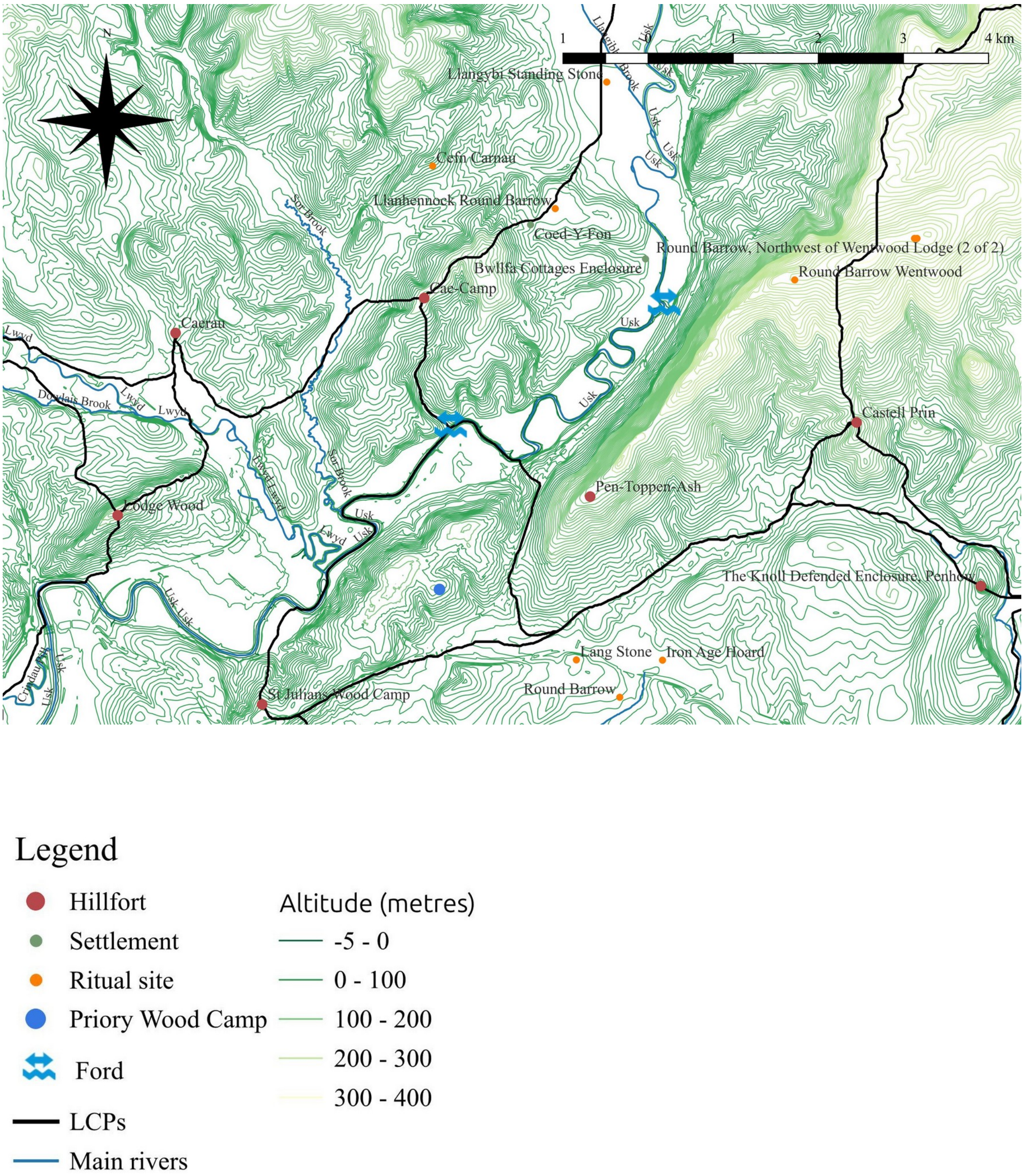
Therefore, such a potential ford may have influenced the site choice for the respective hillforts/settlements adjacent to these rivers (see Table 8). They range from 4.5 km to under a kilometre, and most of these hillforts should have been accessible to their counterpart in under an hour, at a brisk walking pace, to just 10 to 15 minutes for the closer pairs. At their furthest extent, this may be due to the avoidance of flooding or the fact that sites have been ploughed out, therefore being no longer discernible in the archaeological record. The somewhat ephemeral nature of these fording points would mean that a river in spate could also rapidly remove all traces of them. In Table 8, several fords are thought to date to the mediaeval period, but there should be no known reason why they would not be present in these areas during later prehistory. The question of contemporaneity, or otherwise, remains an issue in this analysis though.

Table 8: Rivers and potential associated hillforts indicating a ford (East to West)

River	Eastern Hillfort (Altitude metres)	Western Hillfort (Altitude metres)	Approximate distance apart (from outer edge of hillfort, where available)	Known fording points in the vicinity
Usk	Pen Toppen Ash (GGAT 00415g, Iron Age Enclosure) 190.2 metres	Cae Camp (GGAT 00387g) 113.3 metres	3 km (1.9 miles)	Potential ford between Bulmore and Caerleon to the north of the bridge.
	St Julians Wood Camp (GGAT 00220g) 50 metres	Lodge Wood (GGAT 00597g) 120 metres	2.8 km (1.7 miles)	
Ebbw	Tredegar (GGAT 00049g) 89.6 metres	Graig Y Saison (GGAT 00057g) 110 metres	1.5 km (0.9 miles)	Ford (GGAT 00070g) Mediaeval
Taff	Wenallt Camp (GGAT 00604s, Iron Age Enclosure) 162.3 metres	Llwynda Ddu (GGAT 00713m) 125.3 metres	4.5 km (2.8 miles)	
Ely	Caerau (GGAT 00093s) 77 metres	Coed y Cymdda (GGAT 00010s, Prehistoric Enclosure) Approximately 90 metres	0.86 km (0.5 miles)	
Thaw	Ty'n Y Waun (GGAT 00341m) 33.6 metres	Caer Dynnaf (GGAT 00263s) 94.7 metres	2.2 km (1.4 miles)	
	Llanquian (GGAT 00327s) 87.4 metres		3.5 km (2.2 miles)	
Ewenny and Ogmore	Fleming's Down (GGAT 00467m (Absent from the Atlas) 71.9 metres	Chapel Hill (GGAT 00275m) 28.8 metres	1.1 km (0.7 mile)	Fords (GGAT 01009m and 00286m) Ogmore Castle, ford (Post Mediaeval (GGAT 08937m))
Ewenny	Craig Tan Y Lan (GGAT 00189s) 100.6 metres	Coed Y Mwstwr (GGAT 00382m) 111.6 metres	2 km (1.3 miles)	Bridgend ford (Post Mediaeval (GGAT 08376m))
Afan	Pen Y Castell (GGAT 00678w) 154 metres	Buarth Y Gaer (GGAT 00679w) 311.9 metres	2.8 km (1.7 miles)	
Neath	Buarth Y Gaer (GGAT 00679w) 311.9 metres	Warren Hill (GGAT 00804w) 40.3 metres	2 km(1.3 miles)	Mediaeval ford to the north (GGAT 00631w)

N.B. Altitudes were computed from the HER points.

Figure 40: Potential fording points over the Usk

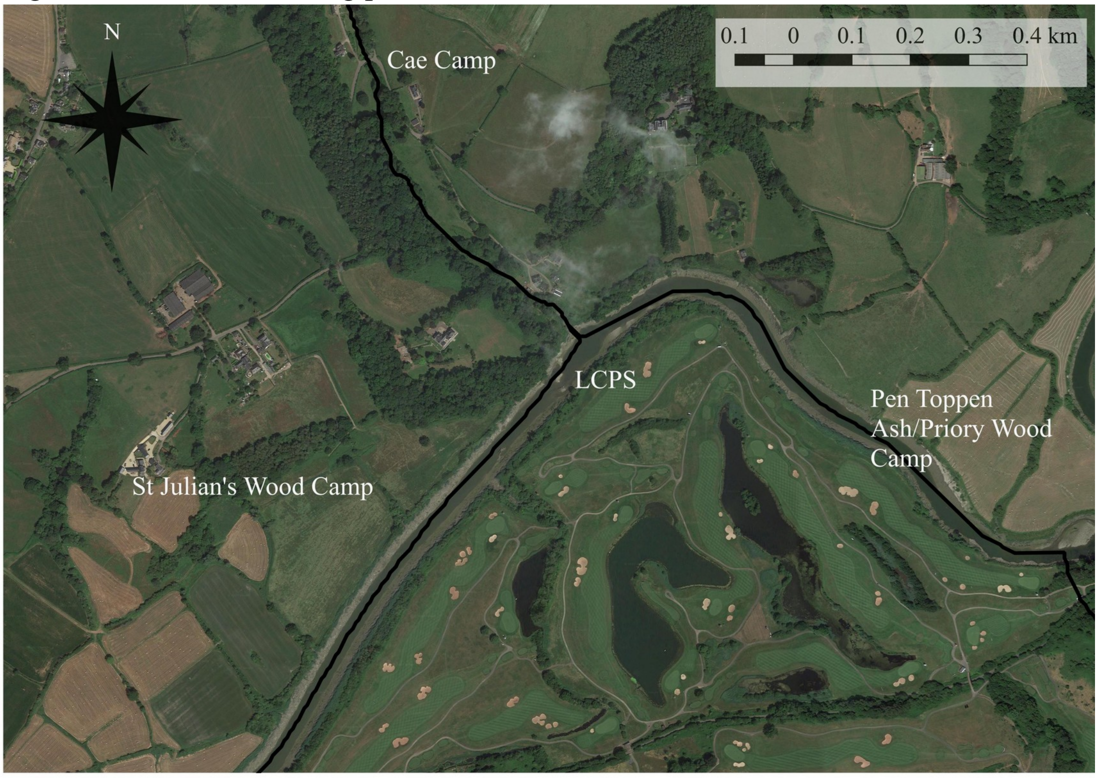


Regarding hillforts, Castell Prin is approximately 2.64 km (1.64 miles) from the potential ford shown in Figure 40, whilst Cae Camp is 2.67 km (1.66 miles) from this point. On the eastern side of the Usk, Pen Toppen Ash is closer still, at 2.3 km (1.4

miles). Their positioning is almost equidistant from this possible crossing point, although other factors would have influenced the siting of these hillforts, such as an appropriate available topography. They may appear to be further apart than the other 'pairs' listed, but to the north of this potential ford is Bwllfa Cottages Enclosure (GGAT 09223g), a prehistoric enclosed settlement that is just 0.58 km (0.36 miles) from the location of the potential ford (Archwilio 2021) and, at its closest point, is just 200 m from the Usk.

The LCP takes a more circuitous route to the south, passing between Pen Toppen Ash and Priory Wood Camp (GGAT 00426g) to Cae Camp. It should be noted that the generated LCPs here run along the Usk, where the actual path, presuming it existed, would have run on one side or the other. The status of Priory Wood Camp is ambiguous and GGAT describe it as an enclosure of unknown provenance, whilst Cadw refer to it as a later prehistoric enclosure. However, the LCP would indicate that a route would have passed between these two sites to Cae Camp from Castell Prin. The crossing point here (see Figure 41) would probably have been passable at low tide, but between the

Figure 41: Potential fording point over the Usk at the confluence of three LCPs



Imagery date 20th July 2021 © Google Earth Pro.

two potential fords, there may well have been several other equally suitable crossing points. LCPs can predict such fording points with some degree of accuracy.

At low tide, the lowest crossing point on the Usk is between Caerleon and Bulmore just to the north of the existing bridge. Nevertheless, it has been suggested that there was also a ford (GGAT 00183g) of a prehistoric date in the location of the Newport Bridge over the Usk.

Caerau hillfort, it has been observed, is adjacent to a confluence of routes and therefore is in a position to exert influence over the crossing points on the rivers Taff and Ely (Seaman *et al.* 2020, 560). Furthermore, Caerau potentially has two options for partner sites on the opposite side of the Ely, Coed y Cymdda (GGAT 00010s) or Cwm George (GGAT 0013s). Coed y Cymdda is probably the more likely of the two at 105 m OD, enclosing an area of c. 0.6 ha and also being the closest of them (Archwilio 2021). Seaman *et al.* (2020, 559), albeit with reference to post-Roman occupation of the area, see it as making "...most sense if it formed part of a wider network of elite residences". Although the role and function of these hillforts would have changed over time, Caerau is observed to have restricted views southwards towards Cwm George and, as such, would have been reliant on Cwm George to monitor the route from the coast to the interior (*ibid.* 560). In terms of the potential pairing of hillforts it appears to break down in the Swansea area, with the Tawe, albeit a single hillfort is present, Carn Nicholas (GGAT 00464w).

The siting of these hillforts near potential fording points need not be seen in a martial light or about control at all but simply as a means of facilitating trade, communication or some other form of community activity. Such locations develop organically in these locations simply by the virtue that they facilitate interconnectivity with other settlements. Reliance on river crossings should not be considered a continuously available option though, as a line of communication could easily be severed by high tides, in the lower reaches of a river, or when a river is in spate due to high levels of rainfall. The combined LCPs should also be seen as part of a network facilitating the movement of goods and people into and through the region. Stratified exchange networks during the Bronze Age resulted in the founding of new settlements that aided intra-regional distribution, which could have necessitated the presence of such routes (Sharples 2007, 175 and 2010, 112, and O'Driscoll 2017a, 73).

The region's LCPs should be considered part of a continuum of routes linking other regions to southeast Wales. It has been suggested that hillforts acted both as waypoints, due to their prominence in the landscape, and provided destinations for travellers, as 'trading nodes' (Condit and O'Sullivan 1999, 35; Brown 2009, 201; Driver 2013, 59; and O'Driscoll 2017a, 73 and 2017b, 514). O'Driscoll (2017a, 74) sees the main role of hillforts, albeit in Ireland, as "…to attract traders and monitor the movement of people and goods in the landscape." However, this appears to be giving too much weight towards an overarching central body, presumably of 'elites'. Hillforts appear, nevertheless, to tend towards being in relative proximity to natural routeways and, by their siting, could have had an impact, psychologically or more directly, on the users of these routes (Hamilton and Manley 2001, 31; Bruck 2007, 31; and O'Driscoll 2017a, 74). The presence of Roman roads in the region indicate possible later prehistoric routes through it; on the simple premise that why create a new network and impose it on the populace when one was already in place. That is not to say that one network completely mirrored the other though. Davis and Sharples (2020, 177) view Glamorgan as the boundary or 'frontier zone' juxtaposing two differing socioeconomic systems, reflected in the reduction in hillfort size as one progresses westward.

Visibility Analysis

With reference to hillforts in Central Laietania, Catalonia Bitriá (2008) considers that there may have been a visual communication network present that would have allowed for the communication of information, such a scenario may also be applicable in southeast Wales. Visibility analysis has also been utilised to address questions of social structure, albeit in this case in a somewhat hierarchical/martial manner (*ibid.*). Nevertheless, the visual significance of hillforts along routes should not be ignored. Bitria (2008) opines,

> A barrier of hillforts placed in the inner line of mountains would have served to protect this centre of power; the agrarian resources in the immediate valley; a

territory's main artery i.e. the pathway along the ridge, and mountainous segments of corridors communicating between valley and coast.

These aspects of landscape organisation may also be present in southeast Wales, although the emphasis on power, hierarchy and control is unwarranted.

To avoid edge issues, the DTM was extended out from the region to assist in assessing the role of hillforts on the region's periphery, such as Gaer Fawr. The central enclosed area of hillforts was utilised to generate viewing points, as this was least likely to have been affected by erosion to the same extent as a hillfort's boundaries. Four classes of visual coverage were generated by adjusting the colour ramp for the produced layer, consisting of None, Low (1 – 3), Medium (4 – 12) and High (13 – 18).

Cumulative viewsheds (visual coverage) and lines of intervisibility (lines of sight) between hillforts were generated from all the hillforts in southeast Wales. Three cumulative viewsheds were produced (see Figures 42, 43 and 44) to determine those parts of the region where, from a combined visual coverage perspective, hillforts or promontory forts featured more strongly or conversely had minimal coverage. Cumulative viewsheds are generated by accumulating multiple viewsheds based on different data points within the site from the same DTM and are overlaid upon one another. The visibility was set at 5 km (3 miles), as at this level, it would also mean that adjacent sites would be readily accessible on foot and should be visible, assuming the absence of some topographic feature or a stand of trees being in the way. Some authors, for example, O'Driscoll (2017a), have been silent on distance, which is surprising given its relevance here. The intervisibility network shows those hillforts that can view one another within a 5 km range to a given viewpoint. On the initial run of the viewshed analysis, a simplified version based on a single viewpoint generated from the HER grid reference for a site was used (see Figure 42). Following this, a more nuanced approach was hoped for by generating 20 random points, at least 2 metres apart, within the polygons produced for the interiors of hillforts (see Figure 43).

Figure 42: Intervisibility network and visual coverage from hillforts based on a 5 km viewing distance and single view point with a viewer height of 1.7 m

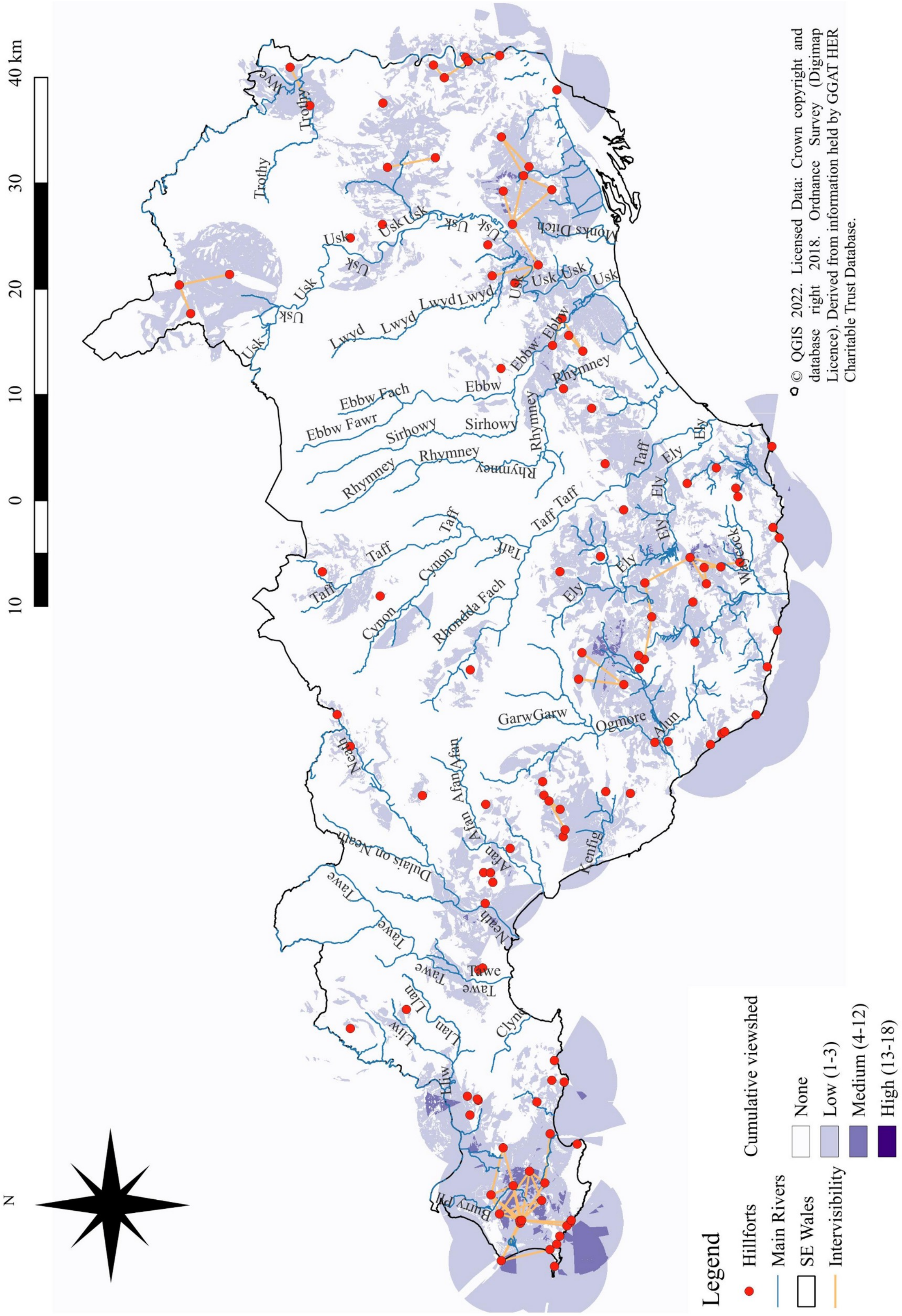
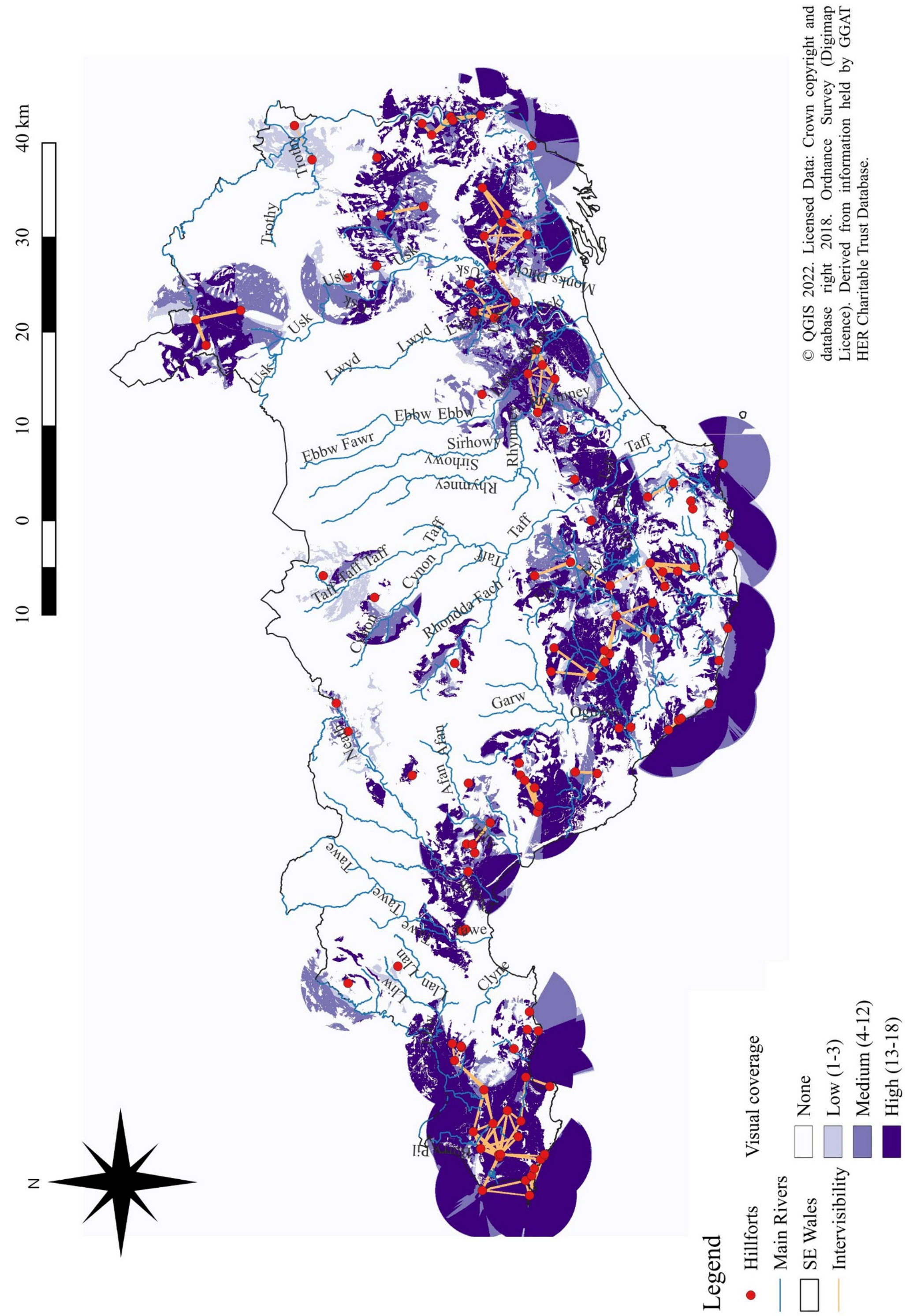


Figure 43: Intervisibility network and visual coverage from hillforts based on a 5 km viewing distance and 20 randomly generated view points, with a viewer height of 1.7 m



Therefore, this first iteration of the viewshed analysis, based solely on the point data provided by the HER, is a relatively coarse measure. The first thing that becomes immediately apparent, although unsurprisingly due to the absence of hillforts, is the absence of coverage in the South Wales Coalfield area of the region.

Low visual coverage levels, indicating poor viewshed coverage, appear throughout the region. There are four areas of coverage: Gower, Neath Port Talbot and Bridgend; Vale of Glamorgan; and Gwent, which the Usk possibly subdivides. The cumulative viewshed concentrations would again indicate the discreteness of Gower from the host region with approximately 5 km between two areas of low coverage. Gower was also the only area with significant levels of medium viewshed coverage and good levels of intervisibility, which focused on Cefn Bryn and the central area of Gower. Present here, on this area of common land, are two Neolithic chambered tombs, Cefn Bryn and Arthur's Stone (GGAT 00273w and GGAT 00068w, respectively), and, from the Bronze Age, burnt mounds, cairns and round barrows all of which indicate the cultural significance of this area for later prehistoric people.

Within Gwent, some hillforts had intervisibility across rivers, such as that between Priory Wood (GGAT 00426g) and Cae Camp (GGAT 0387g) over the Usk. This intervisibility could indicate that the LCPs produced have a degree of validity. An extensive area of low visibility lies to the northeast of Cae Camp (GGAT 00387g) and south of Gaer Fawr (GGAT 01131g). This area of low visibility then runs down to the coast, creating a, relatively speaking, small break to the west of Llanmelin (GGAT 01026g), at 7.5 km (4.76 miles), and those hillforts on the western side of the Wye Valley, indicating a degree of separation here. The overall low levels of combined visual coverage indicate a degree of separateness of those hillforts in mid-Gwent from the main body centred on the coastal margins. Additionally, it emphasises the discreteness of those hillforts either side of the mouth of the Vale of Ewyas and high levels of cumulative visibility to the south and yet not to the north.

Another focus for hillforts is centred upon the rivers Ely, Taff and Rhymney, to the south of Craig Ruperra (GGAT 01672) and Llwynda Ddu (GGAT 00713m), which is separated from Gwent, with a 5.3 km (3.33 miles) area of low visibility coverage or none. This separation may be due to the urban expansion of Cardiff removing hillforts from the archaeological record rather than representing later prehistoric settlement patterns or, at least in part, to the presence of extensive tracts of marshland, the Levels. A noticeable feature of this area is the relative absence of intervisibility between the hillforts present here, as is the case in Gwent.

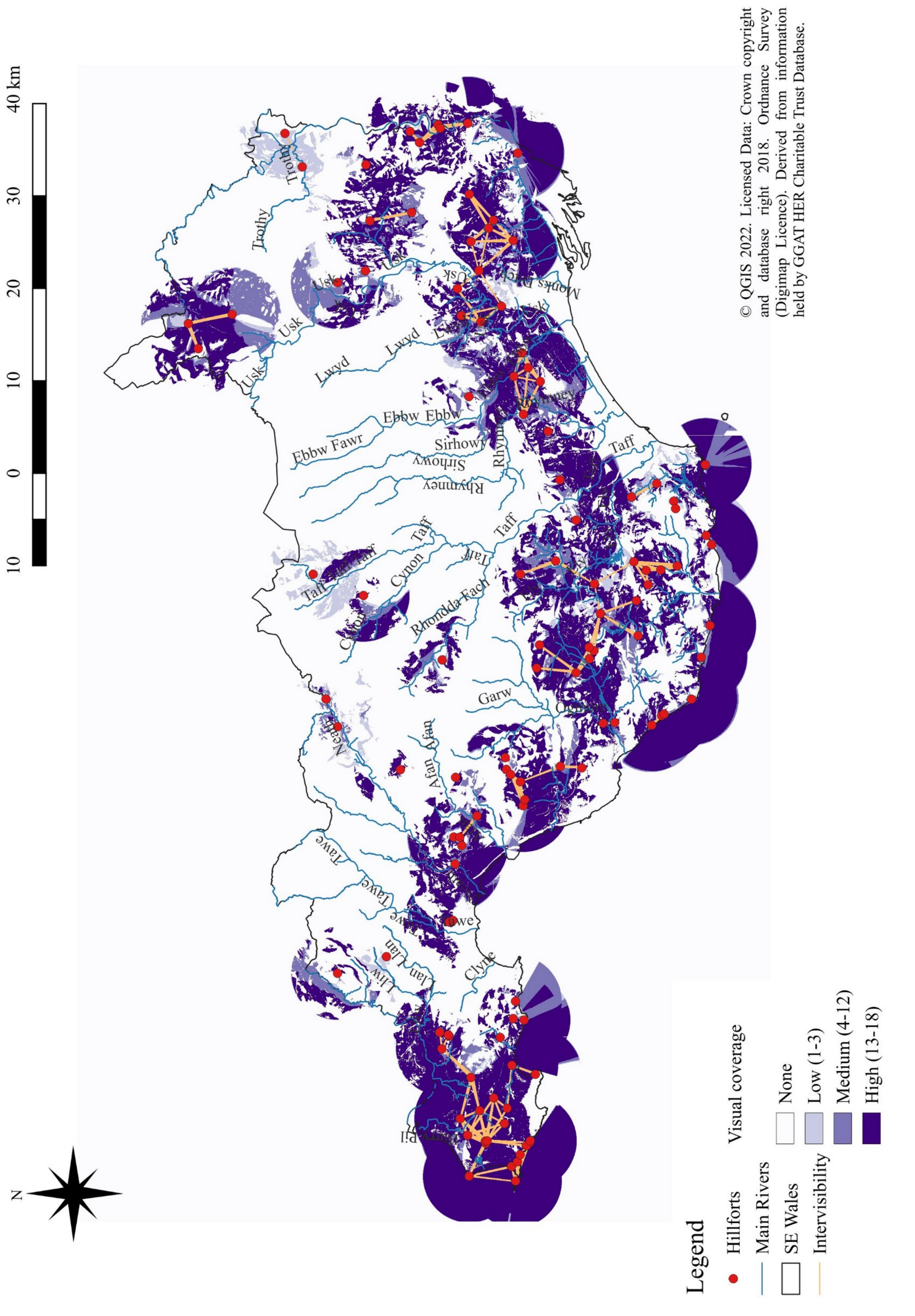
For ten hillforts,

- Castell Morlais (GGAT00831m)
- Cwm George (GGAT00013s)
- Fforest Newydd (GGAT0377w)
- Glyn Neath (GGAT0511w)
- Kennel Grove (GGAT01452s)
- Kymin Hill (GGAT01263g)
- Mitchel Troy (GGAT08941g)
- Pen-Toppen Ash (GGAT0415g)
- Westward Corner (GGAT02103s)

a single point had to be relied on due to the absence of a discernible central enclosure or their late inclusion into the dataset. The general trends were still observable, but coverage went up markedly in the medium and high categories, indicating that, at least at the regional level, ten viewpoints per hillfort is sufficient to draw associations. At the more local level, this more detailed, i.e. 20 viewpoints, approach may be required to give a more nuanced picture of visual coverage for a given area.

As previously discussed in the methodology, later prehistoric peoples would have been more than capable of constructing raised platforms of a few metres in height. The platforms may also explain some of the four poster structures within hillforts. Raising the viewer height by 2 m increased the cumulative viewshed coverage experienced from hillforts (see Figure 44), further emphasising Gower's discreteness. Gower already had

Figure 44: Intervisibility network and visual coverage from hillforts based on a 5 km viewing distance and 20 randomly generated view points, with a 1.7 m viewer height (plus a further 2 m)

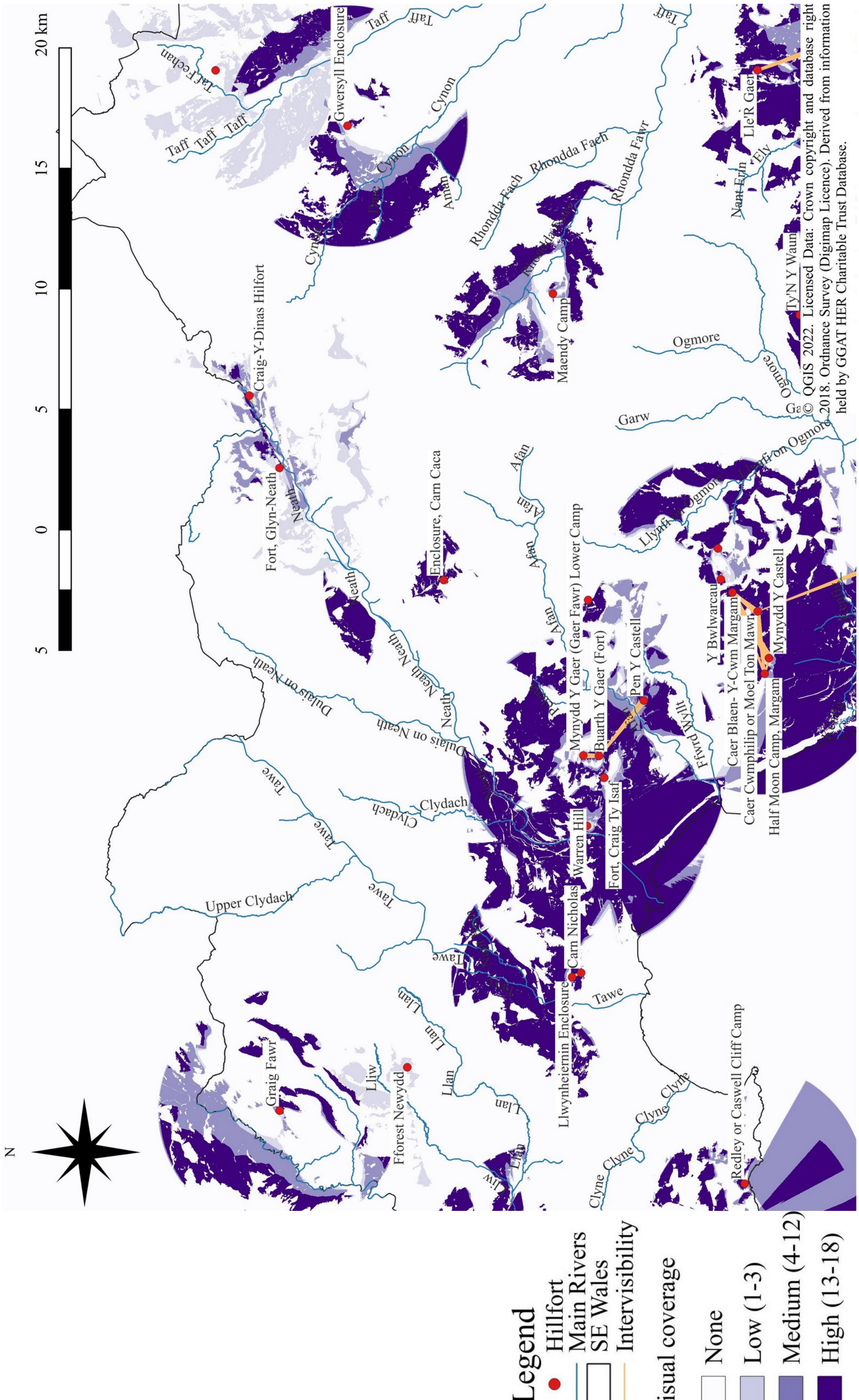


may only be c. 2 km. However, an intervisibility line was not generated from the random points produced, as a 132 m high hill lies between them.

Oddly, the promontory forts along the coast in South Glamorgan have no intervisibility between themselves and the inland hillforts, and visual coverage is also intermittent in this coastal hinterland. This coastal strip of low visual coverage and no intervisibility with the interior also coincides with that of the coastal Roman route passing through the Vale. Visual separation may also indicate separation at other levels, such as that at the economic and political levels, given the relative significance of such visual attributes elsewhere. Proximity to the coast would suggest this stance has credibility, as these sites are ideally situated to exploit marine resources and benefit from coastal trade.

Interestingly, high levels of visual coverage also occur at the southern end of the Neath Valley, which may indicate that the region, in prehistory, ceased here, with the valley acting as a boundary (see Figure 45). Additionally, the Neath Valley may have facilitated a route northwards to Brecknockshire, as it does to this day (A465 and B4242). Along the Neath Valley are at least three hillforts, Carn Caca, Glyn Neath and Craig Y Dinas (GGAT 00564w, 00551w and 01107m). This spread of hillforts along the valley further supports its significance for later prehistoric society. Craig-Y-Dinas (GGAT 01107m) has good visibility to the north and west of the region, focusing on the northern end of the Neath Valley, whilst visual coverage is more limited to the southeast. The area's geography, as there is a steep scarp and a river, the Afon Mellte, to the north, would indicate the site has more in common with the region than that of Brecknockshire to the north. This premise gains greater credibility when considering the high visual coverage levels around the Neath Valley's northern end extending southwards along the valley floor. Carn Caca, sited midway along the Neath Valley, has good visual coverage of the northwestern side of the valley and the area adjoining the hillfort to the north. Glyn Neath (based on one viewpoint) has medium to high visual coverage to the north along the valley floor. If the area of the Glyn Neath hillfort were available, the visual coverage level would have been increased further. A further three hillforts are present where the valley terminates south of Neath, in the area of Mynydd Y Gaer.

Figure 45: Intervisibility network and visual coverage from hillforts based on a 5 km viewing distance and 20 randomly generated view points, with a viewer height of 1.7 m along the Neath Valley



The good visual coverage from Graig Fawr hillfort (GGAT 00345w (see Figure 45), to the northeast of Pontarddulais, and the steep escarpment immediately to its west, which descends abruptly into Dyfed is an ideal place as any to display conspicuous monumentality. Additionally, burnt mounds in this locale indicate the importance of the escarpment as a boundary in later prehistory. Immediately to the south of Gaer Fawr hillfort is a significant bowl-shaped depression that has a diameter of approximately 2 km (1.2 miles) in extent (see Figure 46). The positioning of the hillfort would indicate that its presence here was crucial for demonstrating its significance, both to the west of the escarpment and the basin to the south. As if to emphasise the significance of this site, thirteen funerary monuments are located to the north of this bowl, and there seems to have been an intention to display their presence to both the residents of Dyfed, adjacent to the escarpment and those of the basin. The broadly circular nature of the basin would not have been lost on the area's residents in prehistory. Some view this as a manipulation of temporality, whereby the pre-existing monuments are co-opted into the narrative generated for a given landscape (Wallace and Mullen 2019, 1 – 2).

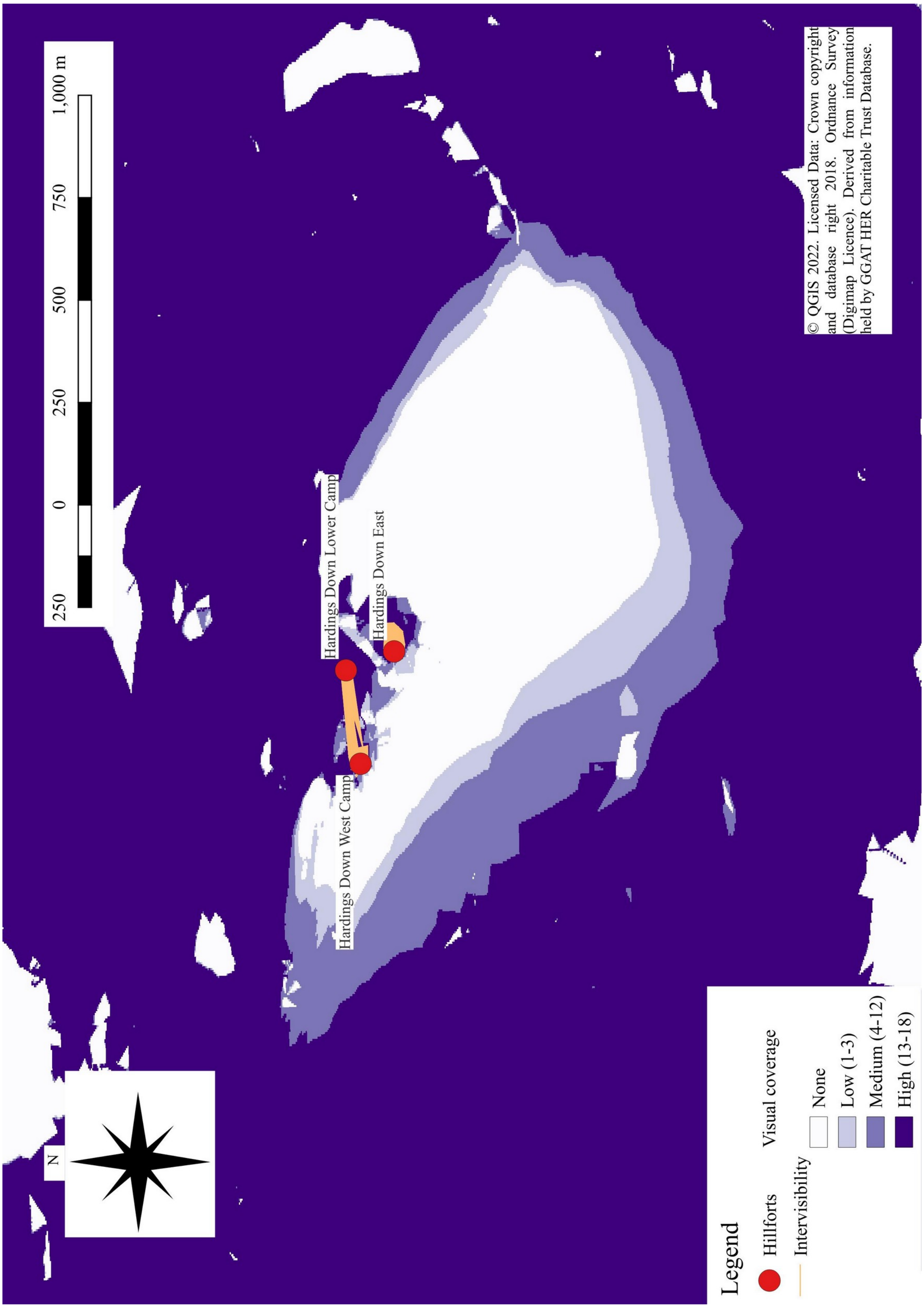
Figure 46: Graig Fawr hillfort

(Imagery date 23rd April 2021) © Google Earth Pro.

Murray (2019, 122 and 134) observes restricted intervisibility between the three hillforts of Hardings Down on Gower. Even though they are less than 300 m apart, indicating a different visual relationship was occurring here than that with other hillforts. Murray observed that the east and west hillforts had only their outer perimeters visible to one another, which appears to be counter, at least in part, to the findings of this thesis, as can be seen in Figure 47, where there appears to be good levels of visual interrelationship between the West and North Camps. In this particular study, visibility points were only generated for the hillfort's interior, and there were still good levels of intervisibility between these hillforts. However, Murray (2019, 119) is silent over observer height, allowance for erosion and the inclusion of palisade, which were all utilised in earlier work by this researcher. Murray (2019, 219) cites the benefits of using GIS, as the resultant research will be "…underpinned by objective and quantifiable analysis". This premise, however, necessitates setting clear and justified parameters and questions that would also allow for comparative studies (see Methodology).

The westernmost hillfort has an area encompassed by two lengths of earthworks that possibly formed an enclosure and is considered the most prominent aspect when viewed from either of the neighbouring hillforts (*ibid*.122). It was observed that this 'disproportionate vallation' is not necessary, from a purely defensive perspective, as the LCPs generated for the site had only minimal interaction with this aspect of the hillfort, and a number of these were blind (*ibid.* 122 and 132). However, these earthworks are considered not particularly visible from the surrounding area and correlate with an area of no visibility (see Figure 47). Given their proximity, it has been speculated that they may have been occupied by the same people, as there would have to have been if they were occupied contemporaneously, a degree of collaboration at the very least.

Figure 47: Intervisibility network between the hillforts of Hardings Down, based on a 5 km viewing distance and 20 randomly generated view points, with a 1.7 m viewer height



Conclusion

For the purposes of this chapter, the definition of a hillfort was reliant upon the Atlas' definition. However, hillforts, promontory forts and other settlement forms should not be considered in isolation but rather as a continuum of occupational forms. To the north and west of the region, smaller hillforts are more dominant; there are only a limited number in the South Wales Coalfield area. Hillforts over 1.2 ha are restricted to the Welsh Marches, coastal margins and areas below 244 m in altitude, probably indicating a link with the more agriculturally fertile lands of the coastal margins. Hillforts over 1.2 ha cease abruptly, except for Cill Ifor Top (GGAT 00233w), at the Neath Valley and could reflect differing farming or cultural practices further westwards.

When the nearest neighbour analysis statistic was applied to hillforts and promontory forts, excluding those to the north of the region, an index value of 0.66 was returned, which indicates a tendency towards a clustered pattern. The negative Z-score corroborated the nature of the hillfort distribution as a clustered pattern being present within the region. This clustering may indicate that hillforts and promontory forts had 'catchments' based on the carrying capacity of the available land. Such clustering or nucleation has also been associated with the spatial representation of polities or indicative of regional centres (Roberts, 2003, 15 – 37; and Bevan and Conolly 2006, 218).

K-means may assist in identifying the aforementioned clusters and, ultimately, the reasons for their existence. The k-means statistic identified four clusters, separated by the rivers Rhymney/Taff, Ogmore, Tawe and Loughor, which defined a Gwent, South Glamorgan, Bridgend-Neath and Gower clusters, respectively. At the fifth and sixth cluster levels, Gwent split into two areas, leading to Llanmelin falling on the periphery of two clusters. Given the presence of Caerwent to the south and its significance, it was determined that Gwent should remain as a single cluster, although from the Ysgyryd Fawr northwards, including the Vale of Ewyas, it is better placed within the Brecknockshire region or as part of an east-west line of hillforts running into Herefordshire, where parts of the cantref were incorporated into England. The presence of the Roman road, following the Usk Valley, with spurs running from Usk to

Monmouth and Chepstow, effectively demarcates a south Gwent cluster. One area that did not fit this cluster narrative was the region's north, centred upon Llwyn-onn and the Taf Fawr, which may be better placed within a separate cluster to the south of Pen Y Fan. The presence of a potential Roman military installation here and road in the adjacent Taf Fechan Valley lend weight to this view. These clusters may be associated with polities or regional centres (Roberts, 2003, 15 – 37; and Bevan and Conolly 2006, 218).

When hillforts and promontory forts were buffered at 3.22 km (c. 2 miles), those within the coastal strip usually fell within the buffered area of at least two other hillforts. At this distance, a short walk of half an hour would have seen an individual traverse the land between two hillforts. Following the buffering of hillforts and promontory forts, LCPs were drawn between such sites in an attempt to replicate the routes taken by people between neighbouring sites during later prehistory. The LCPs generated also indicate the presence of three distinct clusters, Gwent, Glamorgan and Gower. Where there was an intervening river, the LCP drawn was between hillforts closest to the river but on opposite sides. In any event, the LCPs appeared to narrow to a 'pinch point' in such locations. Some such potential fording points were identified (see Table 8) and correlated with areas of skiffles visible on Google Earth Pro, although these could have moved over time. Additionally, fords recorded in the HER were utilised to indicate the potential of fords. The region's LCPs should be seen as part of a continuum of routes flowing through southeast Wales and linking it with other regions. Further to this, hillforts have been considered by some to have acted as signposts or waymarks, given their prominence in the landscape, and acted as 'trading nodes' (Condit and O'Sullivan 1999, 35; Brown 2009, 201; Driver 2013, 59; and O'Driscoll 2017a, 73 and 2017b, 514).

Cumulative viewsheds and intervisibility lines were generated to ascertain whether visual coverage had any significance in the siting of hillforts. The maximum distance was 5 km, as adjacent sites should be accessible and visible to neighbours. There are four areas of coverage, although all are not entirely separate: Gower; Neath Port Talbot and Bridgend; Vale of Glamorgan; and two in Gwent, separated by the Usk. The area with the highest visual coverage and intervisibility levels was Gower, which also had high coverage levels offshore. This coverage also correlated with the results of the cluster analysis, and contrary to initial thoughts on the matter, Gower appears to be a discrete entity, as demonstrated by k-means, least cost paths and visual coverage. Given the number of promontory forts here, this should not come as a surprise but does perhaps emphasise the maritime importance of such sites. To a lesser extent, those hillforts and promontory forts in South Glamorgan also had high visual coverage. Rather than forming a chain of interconnected hillforts flowing through the region, they have coalesced into small groups of hillforts.

The orientation of medium/high levels of visual coverage, such as that of Coed Y Bwnydd, northwards and westwards, and the hillforts around the mouth of the Vale Ewyas, southwards, may indicate that these hillforts fell into different areas. This orientation preference can also be observed concerning Maendy Camp and Gwersyll Enclosure (see Figure 45), located in their respective valleys through which the Rhondda Fach and Cynon flow. From a cumulative visual coverage perspective, Gwersyll Enclosure appears to fall into the Brecknockshire region and Maendy Camp, southeast Wales. Castell Morlais, due to significant reworking of the area, is more difficult to assess; however, low levels of visual coverage that overlap with Gwersyll Enclosure appear to have a more southerly preponderance. Sited at the northern end of the Vale of Neath, Craig Y Dinas and Glyn Neath appear to have visual coverage primarily of the valley floor, whilst Carn Caca has good coverage of the western side of the valley. The high visual coverage at either end of the Neath Valley indicates that this may have been a route to and from the interior of Wales, to the north of the region and possibly demarcated the region's boundary with Gower and Dyfed to the west; a stance supported by the proximity of the Roman road Sarn Helen running along the western margin of the Neath Valley. The siting of Craig Y Dinas at the confluence of the Mellte and Sychryd that then flow into the Neath indicate that this may have been a boundary area between regions.

Towards the central coastal area of the region, the orientation of visual coverage becomes more complex and visual coverage ‘thins out’ over some rivers such as the Garew and Usk. The promontory forts appear relatively visually discrete from the rest of South Glamorgan, which may again reflect differing socioeconomic traditions. This lack of integration is in marked contrast with that of the coast with the interior of Gower, which appears far more cohesive. Strangely, the visual coverage of Gwent and those areas of West Glamorgan, excluding Gower, also appear more integrated visually with the coast and the Levels.

Monumentality figured significantly in later prehistory, as indicated by the presence of a hillfort on Gaer Fawr adjacent to a steep escarpment facing into Dyfed that has high levels of visual coverage to the west. To the south of the Gaer Fawr hillfort is a significant bowl-shaped depression, and the hillfort's positioning appears to be a deliberate attempt to demonstrate its visual significance vis-à-vis the escarpment facing Dyfed and the bowl-shaped depression thereby co-opting them into a cultural narrative.

Chapter 9: Settlements: the analysis, in the context of hillforts and least cost paths

Introduction

At the heart of the lives of people in prehistory was the home, and to understand how society related to its hillforts, it was necessary to determine the distribution of settlements when compared with that of hillforts (see Chapter 8). As they fulfilled a different role and were sited accordingly to fulfil this, viewshed analysis was inappropriate for settlements given that prominence in the landscape was not a key feature of their siting. Furthermore, given that the evidence for settlements is significantly less than for hillforts, it was considered inappropriate to calculate LCPs for them; however, how settlements related to those LCPs calculated for hillforts was crucial in determining how settlements related to hillforts.

As previously observed two thirds of hillforts that have been excavated within the confines of the innermost boundary show no clear evidence for roundhouses (Lock and Ralston 2022, 247 and 311). Nevertheless, the excavated hillforts of southeast Wales, such as Cae Summerhouse Camp, Caerau, Hardings Down camps (West and Lower), Llancarfan, etc. (this list is not intended to be exhaustive) evidence the presence of roundhouses (Archwilio 2024). Should the remainder show no evidence of such occupancy, which is unlikely, hillforts would still form a significant element in the lives of later prehistoric people. Therefore, the interrelationship of hillforts and settlements should be developed forming a narrative in the process.

Smaller enclosed sites in Wales would likely have been farmsteads with their associated roundhouses and farming structures, i.e. four posters and working hollows, rather than being hillforts *per se* (Ritchie 2018). Smaller hillforts, at less than 1.2 ha, start to feature more significantly the further west one progresses within the region, amounting to approximately 31% of all hillforts in southeast Wales, and are likely indicative of occupation by family units, albeit extended. Of all the hillforts in Wales, it is estimated that nearly 40% enclose areas of less than 0.4 ha, and 75% are in southwest Wales

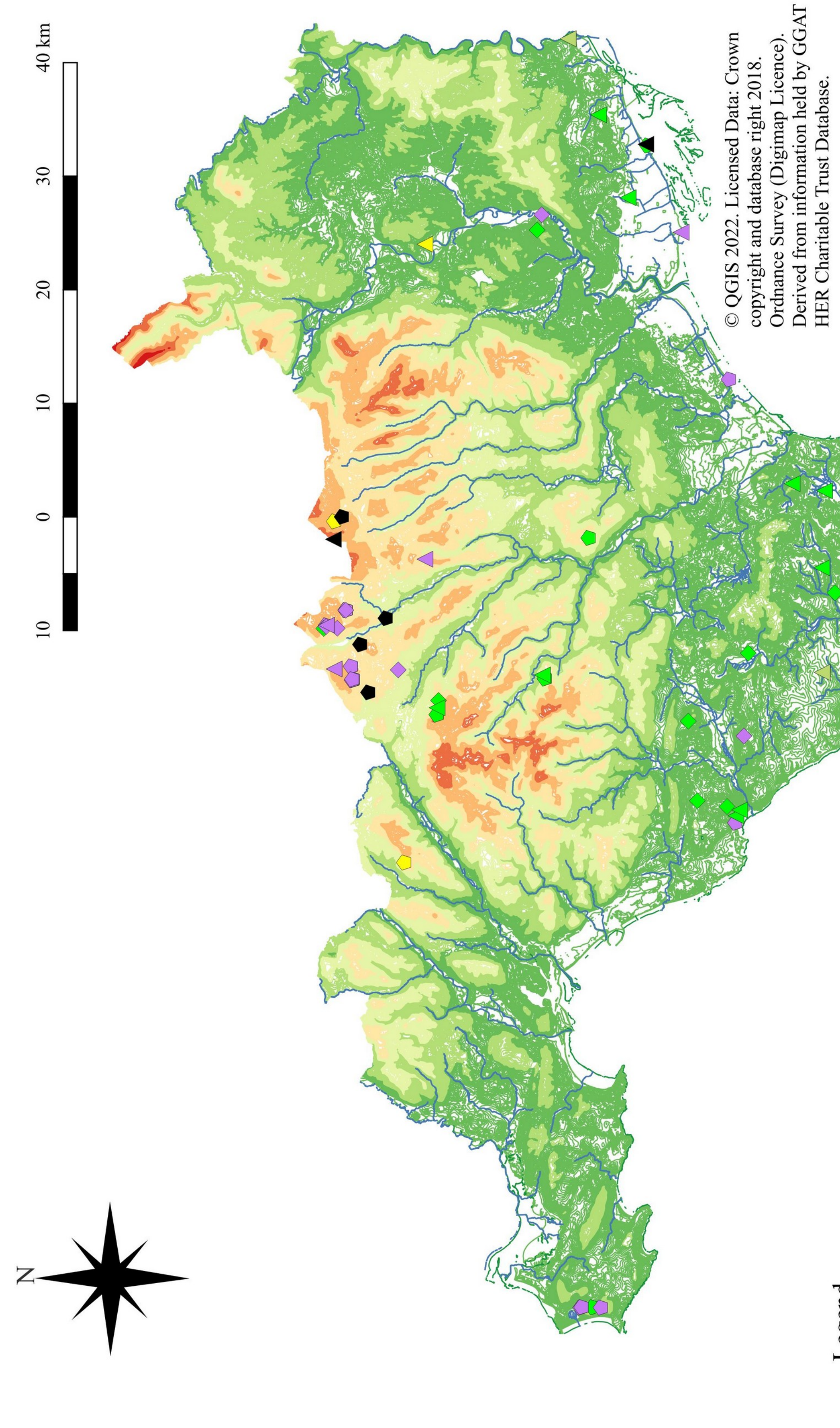
(Cunliffe 2005, 293). Cunliffe's assertion, however, relates primarily to enclosed settlements rather than just hillforts, as they are typically considered to be.

'High-status' farmsteads, such as that at Whitton (GGAT 00382s) in the Vale of Glamorgan, have been cited as indicative of some degree of social stratification (Ritchie 2018 and Evans 2018), although Ritchie's overall premise seems to give too much emphasis on the hierarchical nature of later prehistoric society. Additionally, Whitton was not occupied until the first century AD and may, therefore, be unrepresentative of Iron Age occupation in southeast Wales (Davis 2017, 328). This hierarchical argument has also been utilised to argue that enclosures had a lower status than hillforts, and settlements, presumably, yet lower still (Murray 2016, 10). Such differences, in the main, maybe more akin to those between a hamlet, village or town rather than reflecting the social status of the respective occupants.

Observations have been made about the apparent nature of settlement discontinuity; although to potentially counter this Caerau, Ely acted as a centre of occupation from the Late Bronze Age/Early Iron Age through to the 1st Century BC (Davis 2017, 335, and Sharples and Davis 2020, 175). However, smaller enclosed sites were occupied for just one or two centuries, with intervening periods of abandonment, particularly towards the start of the Roman occupation (Davis 2017, 335). Caution should be exercised when drawing such conclusions due to the unreliability of ceramic dating in Glamorgan though (*ibid.*). Furthermore, given the limited number of excavated sites, it may be unwise to make such assumptions. Should Caerau be representative of hillforts in southeast Wales, then the evidence for continuity rather than discontinuity of occupation would be significant. Davis and Sharples (2020, 175) highlight this importance due to the limited number of sites in the southeast Wales region, which date to the transition period and, as they opine, is probably because of the dispersed open nature of settlement here.

As seen in Figure 48, the evidence for settlement in later prehistory is limited in the region. However, if one were to extrapolate from those areas where there are concentrations, one would see relatively high levels in areas far more hospitable for occupation. Even if the concentrations to the region's north and the west of South

Figure 48: Southeast Wales: Domestic



Glamorgan are not contemporaneous, this should be expressed as higher levels in this otherwise more hospitable landscape. Furthermore, the available evidence for occupation in the Levels supports this stance, albeit this was probably at the seasonal level.

Nearest neighbour

Nearest neighbour results range from zero (highly clustered) to 1.00 (random distribution) through to just over 2.00 (even distribution). Initially, the statistic was run with all known settlements included. Given the relatively small dataset available, it was considered inappropriate to perform a second run removing those to the north of the region, as they formed a significant proportion of this dataset, and to preclude them would likely skew the data even further. However, a second iteration of the statistic was run with hillforts included, as their dataset is considered more representative.

On the first iteration of nearest neighbour, the following were observed:

Results:

Observed mean distance: 2006.17

Expected mean distance: 4424.82

Nearest neighbour index: 0.45

Number of points: 66

Z-Score: -8.5

The nearest neighbour index of 0.45 indicates a tendency towards a clustered distribution and, when combined with the Z score of -8.5, appears to corroborate this distribution of settlements within the region. This clustering or nucleation has been said to occur due to the localised distribution of resources (Bevan and Conolly 2006, 218, and Roberts, 2003, 15 – 37). It would also suggest, as with that returned for hillforts and promontory forts, that they were clustered in the landscape for some purpose associated with a resource, such as the land’s carrying capacity. Alternatively, the absence of suitable areas to site settlements in the upland areas leads to clustering in more hospitable locations. Furthermore, the statistic returned may represent the clustering of available evidence rather than the actual distribution; given the absence of evidence in South Glamorgan and Gwent, this latter position is probably correct.

Nearest neighbour: compound run of the statistic

Given the monumentality of hillforts, they should provide an accurate return because there will likely be few new hillforts to be found in the region. Hillforts, supplemented by settlements, should provide a more complete picture of the later prehistoric occupation of the region. However, the settlement element of the calculation may need revising as and when new sites are discovered.

Results:

Observed mean distance: 3444.34

Expected mean distance: 2956.7

Nearest neighbour index: 1.16

Number of points: 186

Z-Score: 4.30

A returned value of 1.16 would indicate that the distribution leaned towards an even distribution (1 is a random distribution), corroborated by the Z score. A regular or uniform distribution, assuming contemporaneity, is considered to be representative of competitive interactions, site catchments or both scenarios (Bevan and Conolly 2006, 218, and Hodder and Orton, 1976, 54 – 85). Competitive interactions could arise from demographic growth and the subsequent expansion of settlements into new areas or, alternatively, the movement of people from marginal areas, say during a downturn in climate conditions, followed by their movement into more hospitable locations. Such a return would indicate a mature level of occupation within the region and, therefore, given the time invested in their construction, whilst not precluding abandonment, there would be a propensity for occupying these sites for as long as possible. Additionally, people, later prehistoric or otherwise, become attached to a locality, which then becomes a facet of their identity. This identity is then expressed culturally via the construction of monuments such as hillforts, cairns, for example, which further embeds this sense of place in a person's psyche.

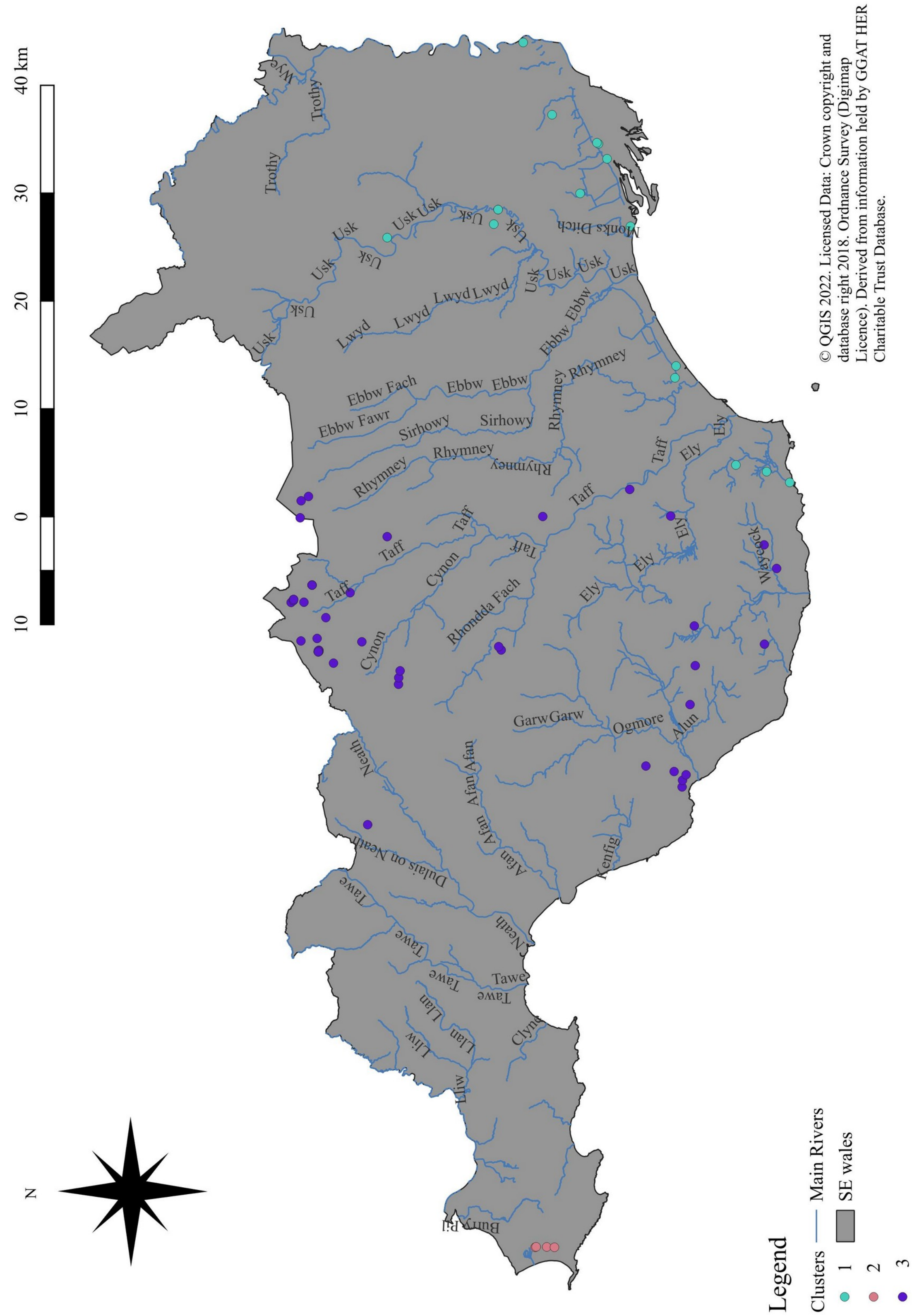
The result should, however, be treated with caution due to the paucity of data for settlements in the region and the possibility that the settlement area to the north was more closely associated with Brecknockshire. Given that this position is likely to be under-representative of the actual level, the likelihood is that, when viewed as a continuum, the settlement pattern was evenly distributed. It would appear that the two types of site were connected in some way by moving from a clustered distribution, when analysed as separate categories, to evenly distributed in the compound, thus expressing some form of interrelationship.

K-means

K-means was run to determine the 'optimum' number of clusters for the region, which may be indicative of socioeconomic factors; such as: a reliance on fishing on Gower; a focus on agriculturally productive land; trade routes; or socio-political status like that of a federal tribal structure, as espoused by Lancaster (2014). Settlements were not isolated features in the landscape of southeast Wales but would have interacted with neighbouring settlements and areas. It was, therefore, necessary to determine whether they were subdivided into clusters. As such, k-means was run at two different cluster levels, 3 and 4, as this was the optimum level for hillforts. Caution must be exercised when relying on these results, as some sites may be better placed within adjacent regions though. Furthermore, the absence of settlement, non-hillfort, evidence for large parts of the region will also adversely affect the results in that they will not be truly representative. Geographically discrete areas, such as a peninsula like Gower, should provide an accurate representation though.

At the three cluster level (see Figure 49), the region's settlements were subdivided into Gower (Cluster 2), an area from the Wye to the Taff (Cluster 1) and, finally, west of the

Figure 49: Three clusters specified, derived from settlements, and identified by k-means



Taff to Porthcawl (Cluster 3). Cluster 3 extends from the coast to the very north of the region and, as such, seems to be blind to the area's topography, which effectively splits this cluster in two. As with the k-means cluster analysis for hillforts, those sites to the north may be best placed within Brecknockshire. The three cluster level is considered as being unrepresentative of the region, and a more nuanced approach needed to be undertaken to best represent settlement patterns in the region during later prehistory.

The former county of Monmouthshire bounded Cluster 1 at the four cluster iteration (see Figure 50) up to approximately the Rhymney River, which acted as the western boundary of Monmouthshire. However, two settlements from Cluster 4 are present just east of the Rhymney in this former county. Gower returned a separate cluster (2), albeit based on just a few settlements. Cluster 4 is broadly concurrent with the preserved county of South Glamorgan, with the area to the north forming Cluster 3 centred upon Mid Glamorgan. Cluster 3, on the northern periphery of the region, probably, again, has more to do with Brecknockshire than the host region from a later prehistoric societal perspective. As seen in Figure 30 (Chapter 8, 202), there is a well-known cluster of hillforts to the north that, given the area's topography, would indicate that the settlements here have more to do with this area than the region.

As settlements form part of a spectrum of site types, which may include some hillforts, and given the paucity of data available, it was determined that it would be appropriate to run the k-means statistic with both sources included to give a fuller picture of later prehistoric occupation in southeast Wales. The k-means statistic was run at the compound form's four and five cluster iterations to allow for a more nuanced result. At the four cluster iteration (see Figure 51), the results were broadly the same as that for the four cluster settlement run of the statistic. The notable exception was Gower (Cluster 1), which expanded towards the Tawe and northwards as far as Gaer Fawr hillfort. However, this may reflect the absence of known settlements here.

At the 5 cluster compound run (see Figure 52) the ‘Monmouthshire cluster’ appears to utilise the Rhymney River, between Clusters 2 and 3, as its boundary. At this iteration, the cluster centred on South Glamorgan was split in two, i.e. clusters 5 and 3, in-between the Ogmore and Ewenny rivers. The Vale of Ewyas remained within the

Figure 50: Four clusters specified, derived from settlements, and identified by k-means

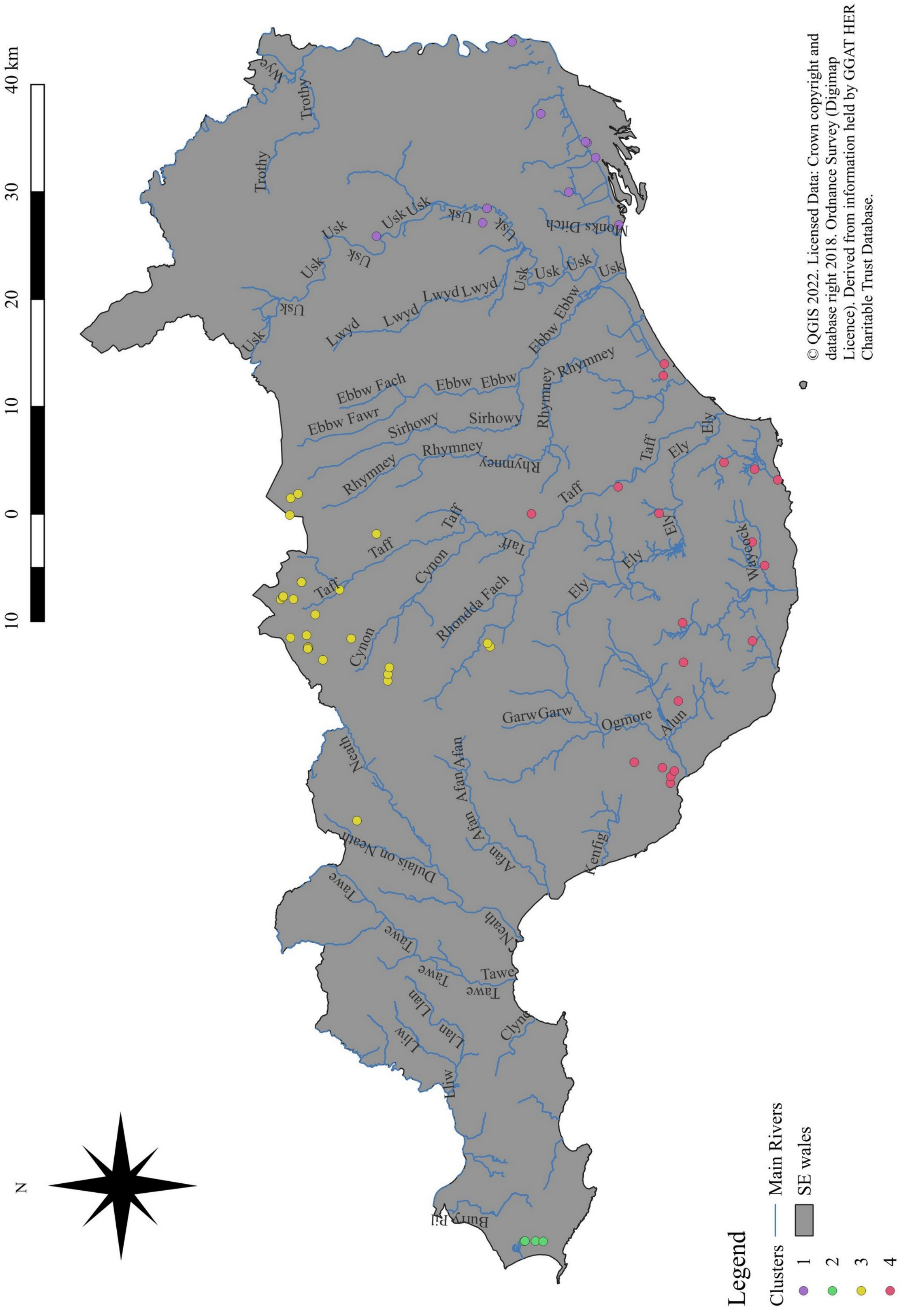


Figure 51: Four clusters specified, derived from hillforts and settlements, and identified by k-means

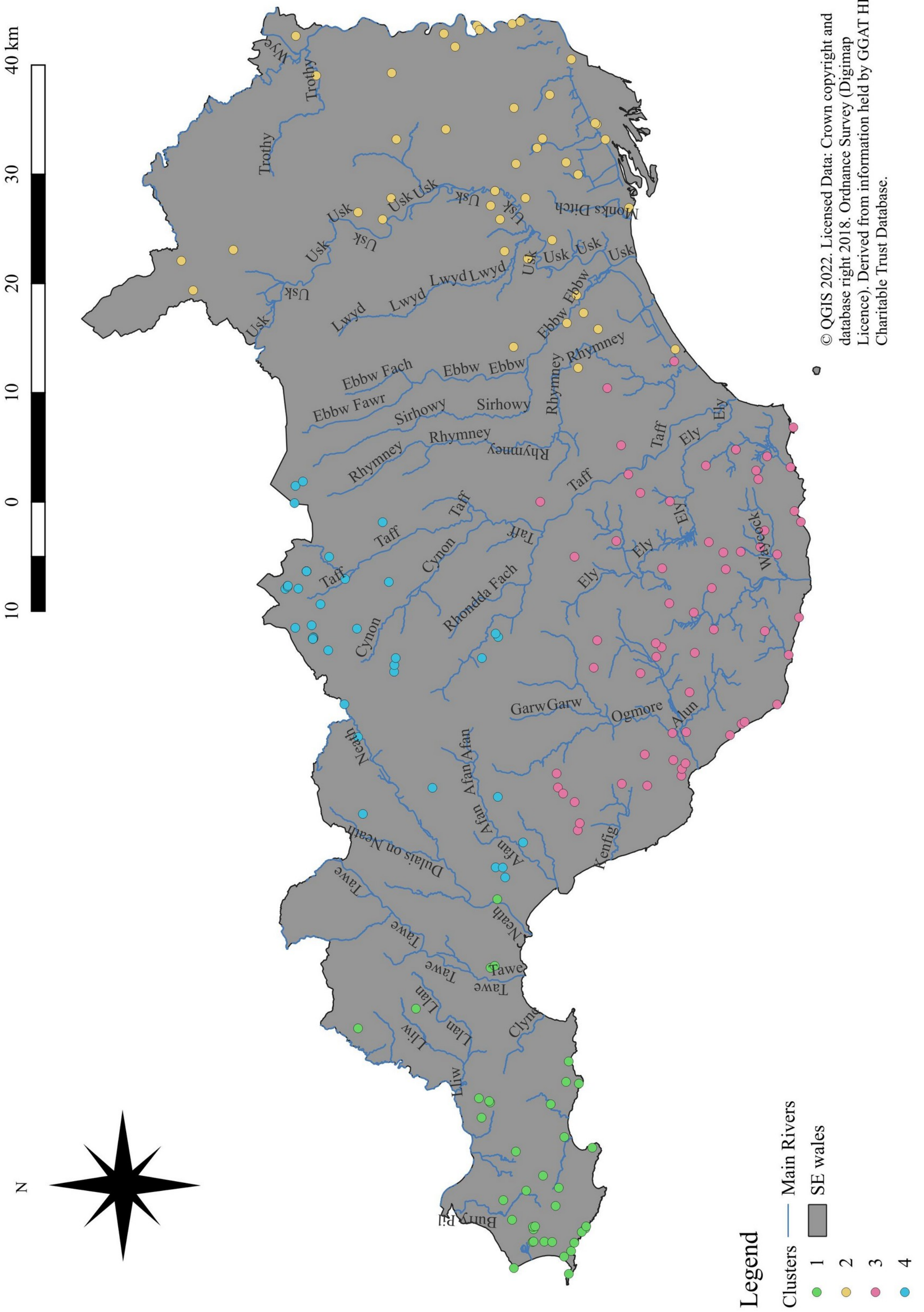
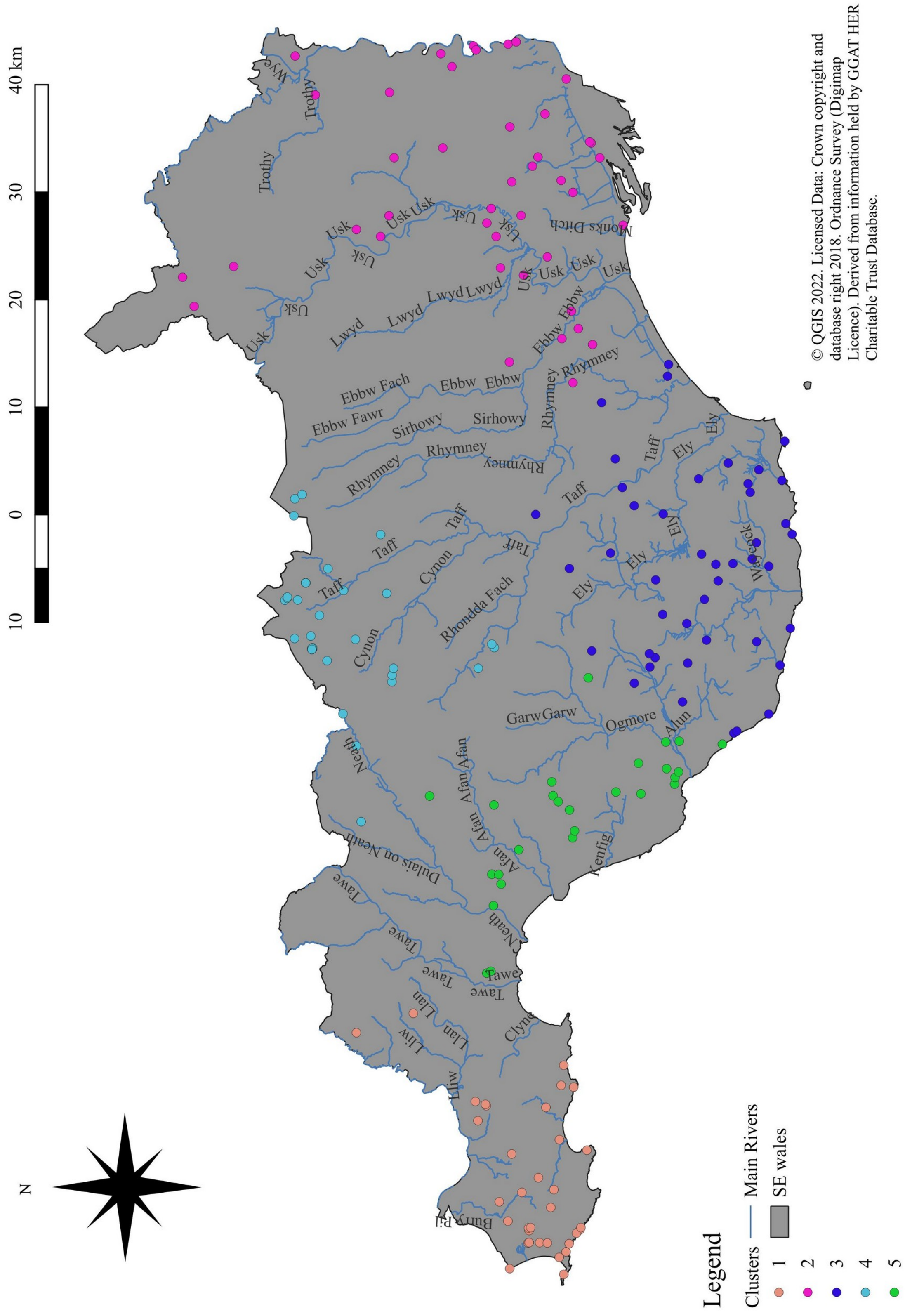


Figure 52: Five clusters specified, derived from hillforts and settlements, and identified by k-means



Monmouthshire cluster throughout these compound iterations of the k-means statistic. Cluster 4, to the north, retreated up the Neath Valley, forming a more cohesive northern cluster, when compared with the 3 cluster iteration shown in Figure 49. Should the statistic's area be extended northwards, the areas likely centred on Llwyn-onn and the Vale of Ewyas would form clusters within Brecknockshire instead of falling within the southeast Wales region. Combined with the visibility analysis, which shows high levels of visibility to the south of the Vale of Ewyas rather than northwards, the direction of visual impact and monumentality lay to the south; therefore, it would indicate the target observers were present here and not to the north. Throughout these various iterations of the statistic, Gower remained a separate cluster, although it did extend eastwards to the Neath River. It is, however, probably best defined by the west bank of the Tawe River at its furthest eastern extent and the Loughor to the west. The high visual coverage and the K-means statistic return appear to indicate a discrete cluster that may in turn reflect the geography of the peninsula and its maritime influences. Elsewhere in the region, its topography, river network, availability of agriculturally productive land would all influence the clusters produced. Interestingly the clusters seemed to align themselves to rivers that also featured in the various preserved counties of Wales.

As previously stated in the Methodology, the aim of employing these various techniques was to be open to them. To reiterate McKeague *et al.* (2017, 3) "Data should not be constrained and straight-jacketed within project reports but liberated and placed within the wider landscape of a digital map". Nonetheless, this does not mean that the results should be blithely ignored, but narratives sought to explain the results. In this case, the presence of sites within the former county of Brecknockshire should feature in any analysis of the region. The topography would support this stance in that the central massif is to its south and creates a boundary between the regions.

Potential sites

Overlaying the LCPs above the satellite imagery in Google Earth Pro (see the black line in Figure 53) allowed one to follow an LCP and view the aerial photography along it. However, given the sheer length and number of the LCPs, it was only possible to undertake this for some of them. This position was exacerbated further by there being over 10 years for which aerial photography was available. Searching through them all for the best conditions for cropmarks that are reliant on prevailing weather conditions, the type of crop present, and the substrate would have been a gargantuan task worthy of consideration in its own right. However, the following act as a proof of concept though and be best done utilising Artificial Intelligence. As such, areas were identified for particular scrutiny, such as the ‘blank areas’ identified by Davis (2017, 331).

To the west of Llanmaes and on the edge of a ‘blank area’, Coflein records the presence of a probable Roman Villa near Wick (grid reference SS9329071640 and NPRN 411701 (see Figures 53 and 54)), described as having a univallate ‘defended’ square form, c. 45 m across. This site was identified from Google Earth aerial imagery, dated 2001, as a cropmark in a field of ripe barley (Coflein 2021). A detectorist also found brooches and coins from the later Iron Age to the Romano-British period (*ibid.*). To the southwest are several springs, Ffynnon y Brychau, that Coflein (2021) consider relevant to its siting.

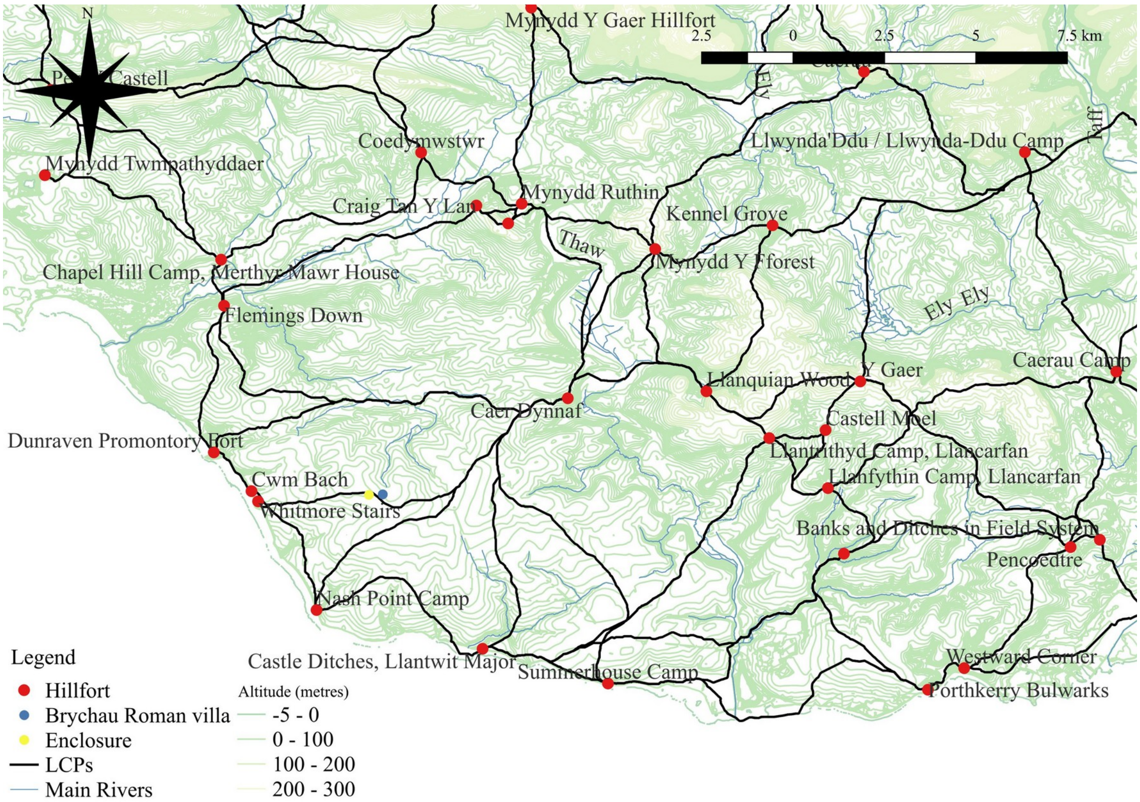
Figure 53: Potential Brychau Roman villa and prehistoric enclosure, Wick

Black line indicates the route of an LCP (Imagery date 2001, © Google Earth Pro)

To the west of this site, on the opposite side of the road (grid reference SS9291071597), is a site reported as an abandoned mediaeval village. If it is indeed mediaeval, it would, nevertheless, constitute a hamlet given the scale of the cropmark at approximately 50 m north-south and its maximum east-west extent of 40 m. The site's form is more ambiguous than this brief description indicates, and there appear to be field boundaries in association with this site. Within the same field (GGAT 01443m), a plano-convex flint knife was also found and dated by typology to the Food Vessel Culture by association to barrows in Wales (Archwilio 2020).

The LCP was generated between Caer Dynnaf and Whitmore Stairs on the coast (see Figure 54). These two sites are approximately 380 metres apart, almost equidistant from the LCP generated for hillforts and promontory forts, with the potential Brychau Roman

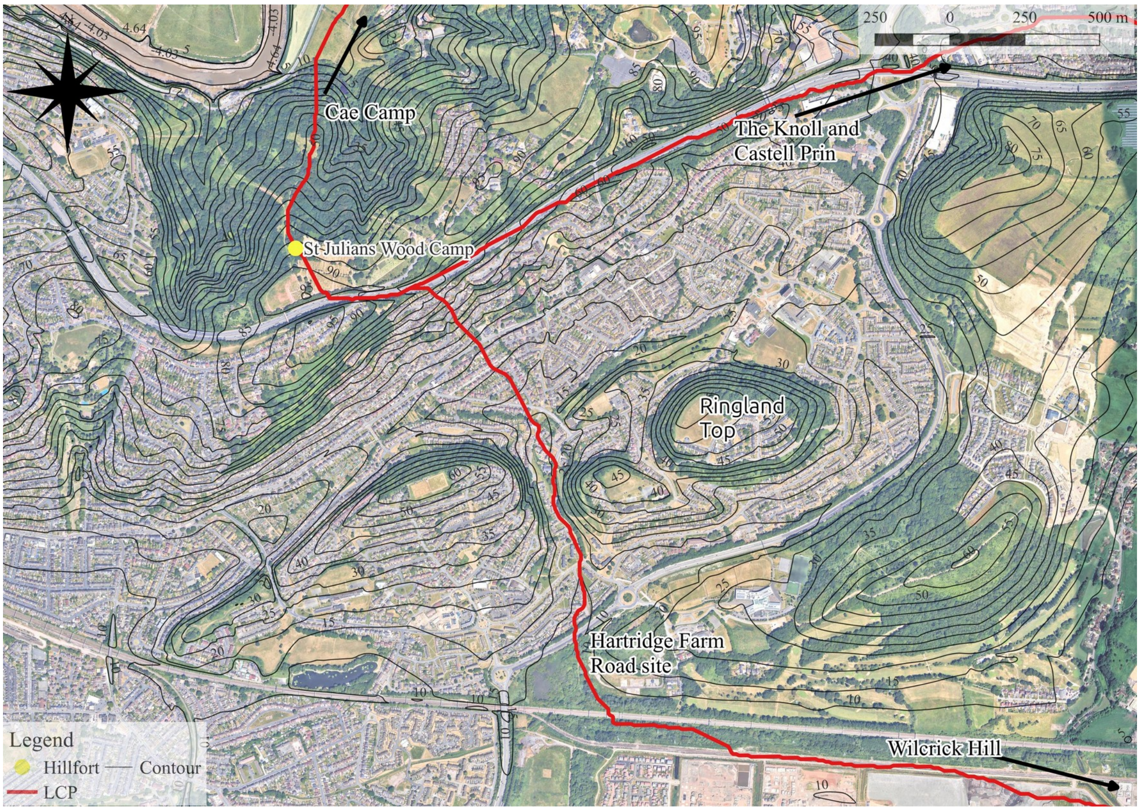
Figure 54: Potential Brychau Roman villa and prehistoric enclosure (Wick) and LCP, Vale of Glamorgan



villa at 197.3 m from the LCP and the site at 181.28 m; their juxtaposition with the LCP could corroborate a link. These associations and others indicate a more profound link with the past in the region than one might initially anticipate. It would also appear to erode at least one of the ‘blank areas’ identified by Davis (2017, 331), such as that around Llandow and Wick.

In Newport, Gwent at c. 400 m to the east from the LCP linking St Julians Wood Camp and Wilcrick Hill is Ringland Top (see Figure 55). Ringland Wood encompasses the eastern part of the site, whilst on its northwestern periphery is an area called The Circles. The LCP here is probably unreliable to utilise, at least where it passes through the Levels, although in the vicinity of Ringland Top it should be fairly accurate in terms of the local movements of people. Nonetheless, an LCP linking Castell Prin and The Knoll with St Julians Wood Camp passes c. 730 m to the north of Ringland Top. Again,

Figure 55: Potential hillfort Ringland Top, Newport



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somewhat unfortunately, this section of the LCP cannot be relied upon as it follows the M4, which for much of this section is within a cutting. Should the LCP have been broadly aligned with the current Chepstow Road it would bring the LCP within just 450 m of Ringland Top.

The 19th Century OS map of the area shows various tracks and paths running immediately around Ringland Top (surveyed 1881– 2 OS 1886). Any observations, nonetheless, should be caveated in that such paths would probably not have existed in later prehistory, but Chepstow Road being an historic arterial road in Newport, between two towns with a focus on the town bridge is another matter. As such, subject to some lateral movement a long its course, it is likely to have existed for some considerable period of time. In support of this stance, following the Norman Conquest, it is probable that a bridge was constructed here and is referred to in a land grant of 1072 – 1104 (Brown, 2011). Further weight is given to this assertion by the potential presence of a prehistoric ford in the same location as the current bridge (GGAT 00183g (Archwilio, 2024)). Should there be a hillfort or settlement here it would have undoubtedly had an effect on the local network of paths, probably acting as a node drawing adjacent paths to it. Given the presence of the Levels immediately to the south it is unlikely that any route to the crossing of the Usk would pass here, but take a route to the north.

Ringland Top would have been on the northern periphery of the Levels with clear views to the south and southwest. From here the ground falls steeply away to the 40 m contour and after plateauing out for a distance, drops below the 20 m contour. The visual impression given is one of an island, particularly if one were to visualise the presence of the Levels encompassing it. In Figures 56 and 57 can be observed circular parchmarks of varying diameters that are present, which may be indicative of occupation here. Further to west and closer to the LCP is Ringland Primary School where further circular parchmarks are present. Given the post-war development of the area, a sizeable proportion of Ringland Top was developed for housing. Despite the presence of extensive parchmarks here, there are no known archaeological records present for this area on the HER.

Figure 56: Potential hillfort Ringland Top, Newport (2023)

Imagery date 2023, © Google Earth Pro

Figure 57: Potential hillfort Ringland Top, Newport (1945)

Imagery date 1945, © Google Earth Pro

To the south, an archaeological field evaluation was conducted off Hartridge Farm Road, Newport prior to the determination of a planning application for a Gypsy/Traveller site here (Stafford 2015, 4). The LCP between St Julians Camp and Wilcrick Hill clips the western edge of this site; whilst features on the lower slopes in the southwest corner of the site, revealed during this evaluation, indicate occupation from the late Iron Age to the Roman period (*ibid.*). Stafford (2015, 28) considers the archaeology is suggestive of settlement here, which dates from the late Iron Age through most of the Roman period. To the northeast of this site, at approximately 500 m, lies Ringland Top. Assuming the absence of tree cover, intervisibility between the sites would be excellent.

To the east of Hartridge Farm Road lies, approx. 2.9 km (c. 1.8 miles) away, a potential Roman fort (GGAT 09228g) and an earthwork of unknown date (GGAT 02458g) immediately to the north of Great Wood (see Figure 58). As can be seen in the 2016 aerial photograph there are numerous circular parchmarks present and their presence is

Figure 58: Parchmarks Llanwern (2016)

Imagery date 2016, © Google Earth Pro

not mentioned in the HER. Given the proximity of these sites and their presence on the northern periphery of the Levels suggests that this liminal zone merits further exploration.

Ritual prehistoric sites adjacent to or on LCPs

As Herzog (2014) observed, "…paths often developed over long periods and were not formed by a single individual but are the result of the experience of many"; this would indicate the longevity and cultural significance of many such routes, which as such are not bound by the usual periods allocated to prehistory. As Lock and Pouncett (2010, 192) opine, cultural features in the landscape would have acted as 'signposts or waypoints', but they may have also been a destination in their own right. An LCPs proximity to ritual sites may indicate that the motivating factor for locating such a monument in a given location was its proximity to the path from which they could be experienced.

Interestingly, several ritual sites lie on or close to a number of the LCPs (see Table 9) in the region, and in one case, Redland standing stone, appears to be at or near a crossroads of two LCPs (see Figure 59). Whilst the LCPs were plotted to show the optimum route (i.e that which minimised the effort required to move from one point to the next), the presence of these sites may have exerted a 'pull factor' and in reality the path may have come closer still to the monuments in question. Alternatively, the monuments may have repelled the route from their proximity with the divine.

The first LCP runs east-west between Caerau (GGAT 00093s) and Llanfythin (GGAT 00397s) at c. 10 km (6.2 miles) in length; the second, runs north-south, between Y Gaer (GGAT 00358s) and Pencoedtre (GGAT 00943s) and GGAT00791s at c. 8.7 km (5.4 miles). A short distance to the northwest of Redland is another prehistoric monument, CottrellPark standing stone. The north-south LCP passes on the western side of several prehistoric monuments, such as Coed Y Cwm chambered tomb, Tinkinswood chambered tomb, St Lythan's round barrow and Wenvoe round barrow. The various monuments, dating from the Neolithic through to the Bronze Age, indicate the

Table 9: Proximity of prehistoric monuments to LCPs

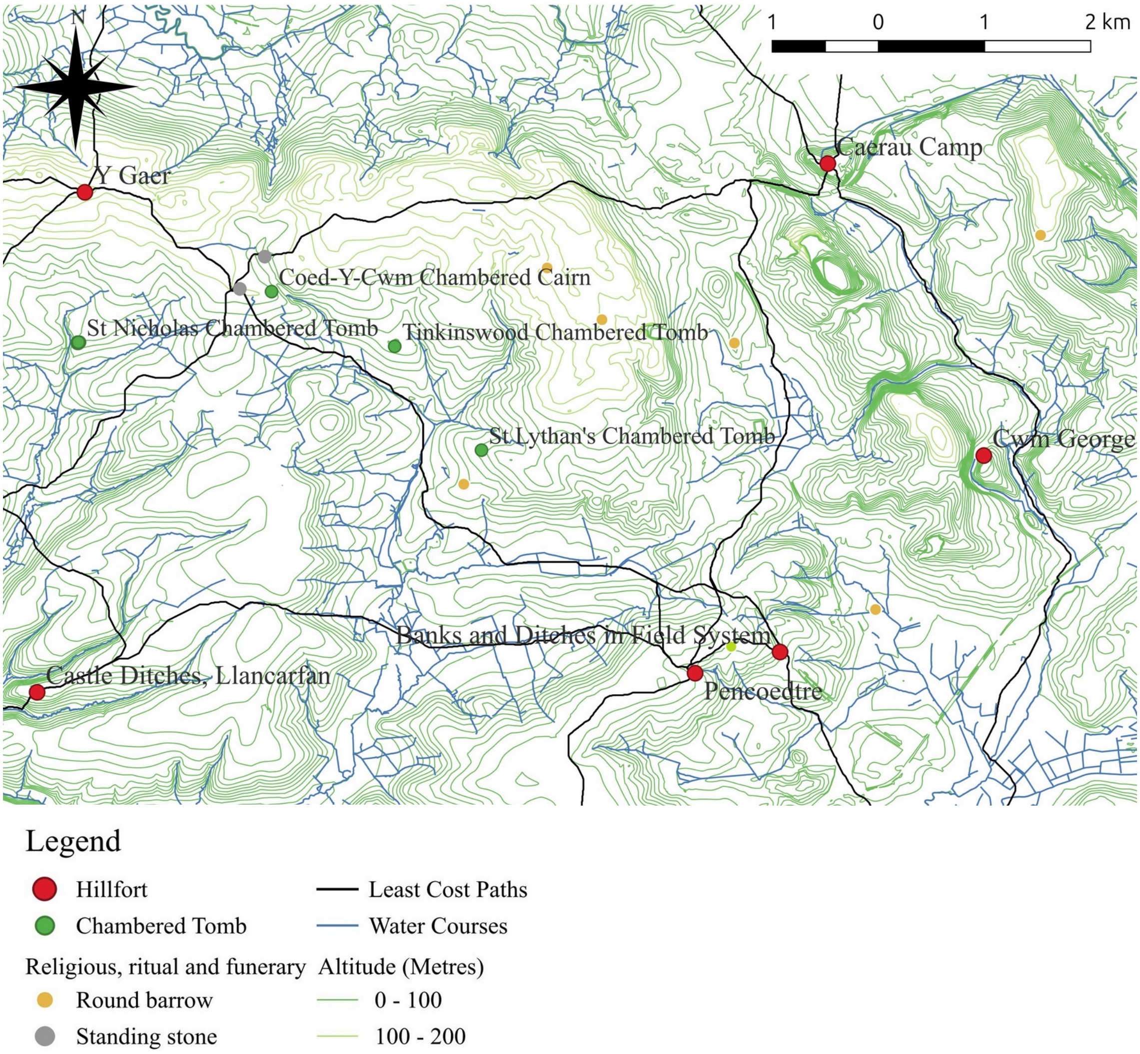
Monument	Distance from LCP	Period
Cottrell Park standing stone (GGAT E000739)	13 metres	Neolithic
Redland standing stone (GGAT 00370s)	17.3 metres (80 metres from 'cross roads')	Neolithic
Coed Y Cwm chambered tomb barrow (GGAT 00369s)	197 metres	Neolithic
Tinkinswood Chambered tomb (GGAT 00376s)	294 metres	Neolithic
Dyffryn Monument Complex (GGAT 03826s) and Maesyfelin (GGAT 00003s)	515 metres	Neolithic
Wenvoe round barrow (GGAT 00377s)	340 metres	Bronze Age

(Site location and period data sourced from the HER and Archwilio 2021)

significance and temporal longevity of the path in question, as these monuments were presumably sited here to incorporate the religious into everyday life with the passage of people's feet. Alternatively, the path may have only been utilised on certain occasions to emphasise their uniqueness to the local people in prehistory. In any event, they would serve a purpose in forming part of the local community's cultural identity and claim to the land.

Other such apparent 'associations' can be seen at Caer Dynnaf (GGAT 00263s) with the LCPs running to three promontory forts on the coast; that include Castle Ditches (GGAT 00447s), Nash Point (GGAT 00400s) and Whitmore Stairs ((GGAT 00337m) see Figure 60). Where these paths fork, several round barrows are situated to the north of Breach Farm. The LCP connecting Caer Dynnaf with Cwm Bach (GGAT 00336m) and Whitmore Stairs passes through 3 round barrows at Cant Erw, and others are close to the LCP. These monuments being located so close to paths would further indicate the importance of these routes in prehistory. Avoiding these monuments whilst moving between the coast and Caer Dynnaf would require a detour. Bronze Age barrows on or

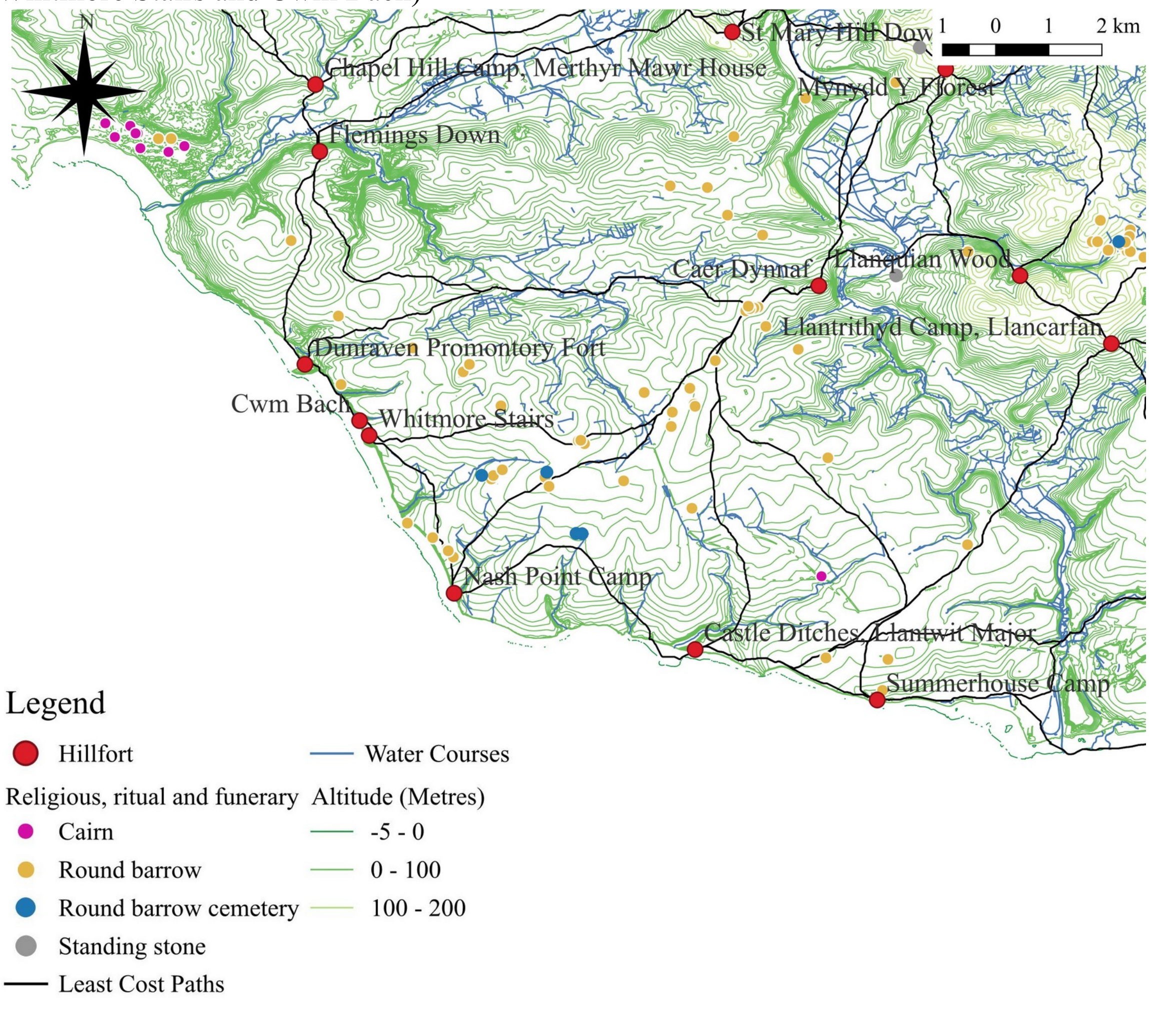
Figure 59: Siting of ritual sites in proximity to LCPs (Y Gaer to Pencoedtre)



near hillforts have been argued to be a further expression of territoriality (Brown 2009, 209). However, this demarcation could also be co-opted by utilising Neolithic monuments by siting hillforts close to such sites or where there is an existing Neolithic monument, such as the causewayed enclosure at Caerau.

The various routes throughout south Wales would have been a significant feature of later prehistoric life. Furthermore, the presence of monuments on or close to these routes indicates that they had been in use for significant periods of time and would have provided a potent reminder of one's cultural identity and claim to a given locale. To reiterate Herzog (2014), "…paths often developed over long periods and were not formed by a single individual but are the result of the experience of many." This experience would have undoubtedly become firmly embedded within the psyche of those who regularly utilised these paths. Furthermore, for those alien to the area, it would be a potent statement as to the identity of those residing here. As such, these routes were not strictly functional but had a deeper meaning for the people in the area.

Figure 60: Siting of ritual sites with reference to LCPs (Caer Dynnaf to Nash point, Whitmore Stairs and Cwm Bach)

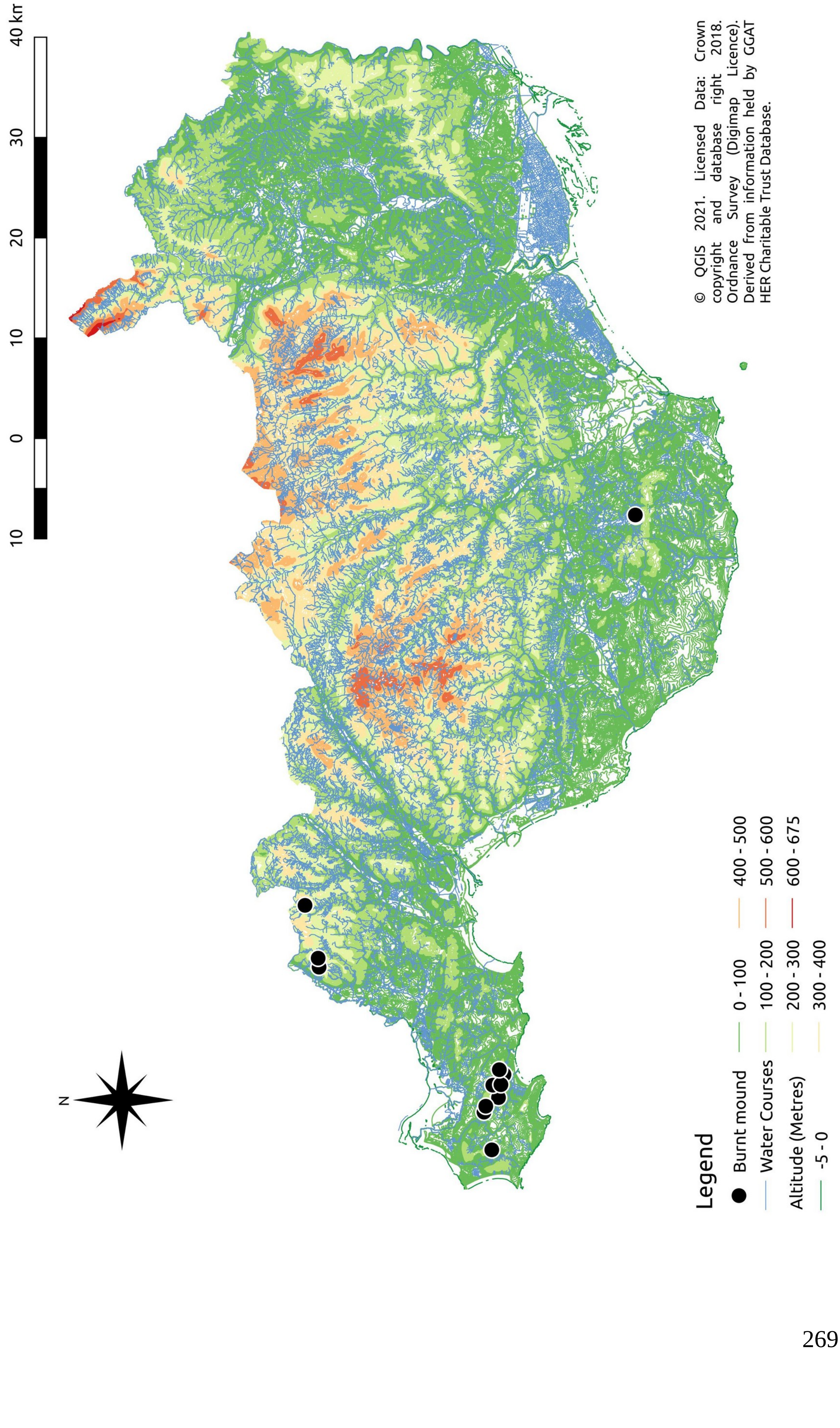


Burnt mounds

Burnt mounds are largely missing from the region's narratives (see Figure 60) despite the presence of 15 within southeast Wales. They usually consist of a lunate mound of burnt stones with a centrally located trough or pit near water (Lynch 2000, 90; Darvill 2002, 116; and Hart *et al.* 2014, 135). The stones are thought to have been heated before placing them in water in the trough, which, it has been suggested, were then utilised for cooking or a number of other uses, including as a sweat lodge (Darvill 2002, 116; Knight 2007, 196; and Hart *et al.* 2014, 135). It has been speculated that their use may have continued into the first millennium BC but originated in the later Neolithic (Knight 2007, 196). Lynch (2000, 90) favours the explanation that they are cooking sites for hunting parties, but this explanation is unsatisfactory given the location of some of these sites.

The HER assigns them to the ‘Domestic category’, regarding their ‘Broad Class’ and Bronze Age, regarding their perceived period. These assumptions may be proven to be unfounded, though, as 184 (64 sites) radiocarbon dates have been obtained for such sites in Wales, ranging from the earlier Neolithic to early mediaeval period; therefore, they should not be relied upon as ‘type sites’ (Burrow 2018, 110). Outside the region at Ammanford, Carmarthenshire, approximately 5km away from the region’s border, a trough beneath an ovate mound was radiocarbon dated to 980 – 820 cal BC (Darvill 2020, 75). The absence of any associated settlement activity, generally with burnt mounds, would indicate that they did not have a domestic function, whilst the absence of artefactual remains points to a temporary or episodic use (Lynch 2000, 90; Halsted 2011, 61 and 62; and Darvill 2020, 75). The interrelationships of such sites with settlements in the region are poorly understood, and Knight (2007, 196) suggests that such sites may be analogous to midden sites, such as Llanmaes, in that they facilitated community cohesion, i.e. a meeting place, drawing in people from a dispersed settlement base within the region. Although not settlements, their inclusion in the analysis is essential as they would have played an important role in people's lives.

Figure 61: Southeast Wales: Burnt mounds.

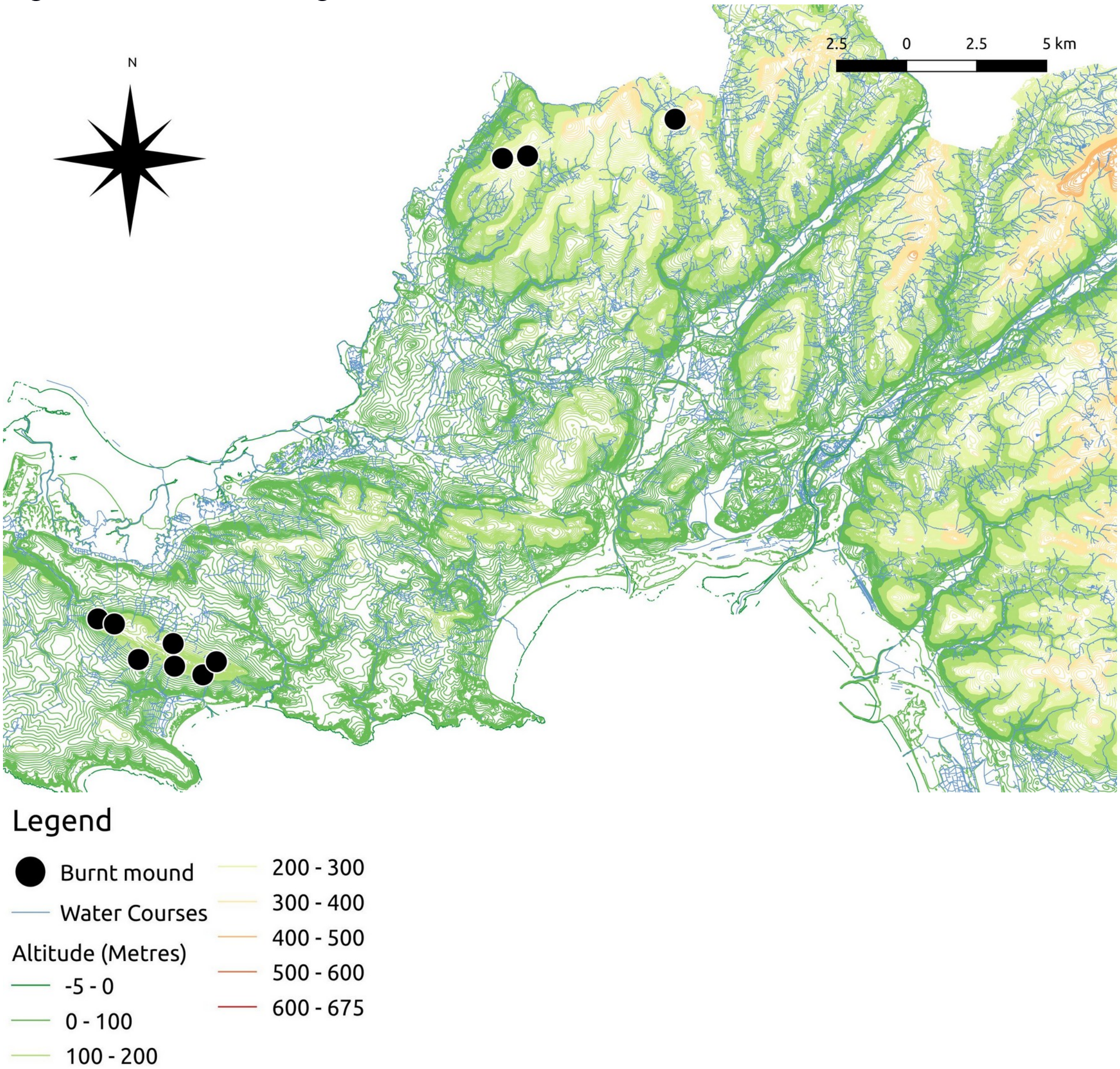


In southeast Wales, there is a concentration of these monuments on Gower, with 9 of the 15 mounds present in the region being found here and, furthermore, a minor concentration of 4 (3 at Graig Fawr- GGAT 00342w, 00343w and 00344w) in the northwest of the region. Burnt mounds are generally absent from the coastal margins, except for Gower, although there are two (GGAT 00182s and 00183s) in the Vale of Glamorgan and none are known in Gwent. This limited presence has also been observed by Lynch (2000, 90) with regards Glamorgan. Their absence may be explained because they have been ploughed away in the more productive agricultural areas. Nonetheless, this does not explain their absence from upland areas, where farming practises have not been so intensive.

Two burnt mounds (GGAT 00342w and 00343w) at Graig Fawr (see Figures 62 and 63) occupy a prominent position on the westward facing escarpment. This location would not be one that one would choose to cook at, except on special occasions, although a hillfort is nearby. Another burnt mound is on the western side of the Loughor, almost as a counterpoint, at Llanedi, Carmarthenshire (PRN 823). The juxtaposition of these two sites on either side of the Loughor and with the Graig Fawr burnt mounds, present at the crest of an escarpment, is as an indiscrete location as possible and, therefore, should be seen as a declaration of one's presence here. This view is further endorsed by the presence of a significant number of ‘Religious, ritual and funerary sites’ in this locale.

On Gower (see Figures 61 and 62), the burnt mounds are concentrated around Cefn Bryn anticline, a ridge of Old Red Sandstone, and follow the orientation of the anticline, i.e. in an ESE to WNW direction. This group of burnt mounds enclose this geological feature and are not located at the highest points, contrary to the positioning of the burnt mounds at Graig Fawr in this respect. Their societal role would appear to have been ritualistic, given their location and proximity to other monuments.

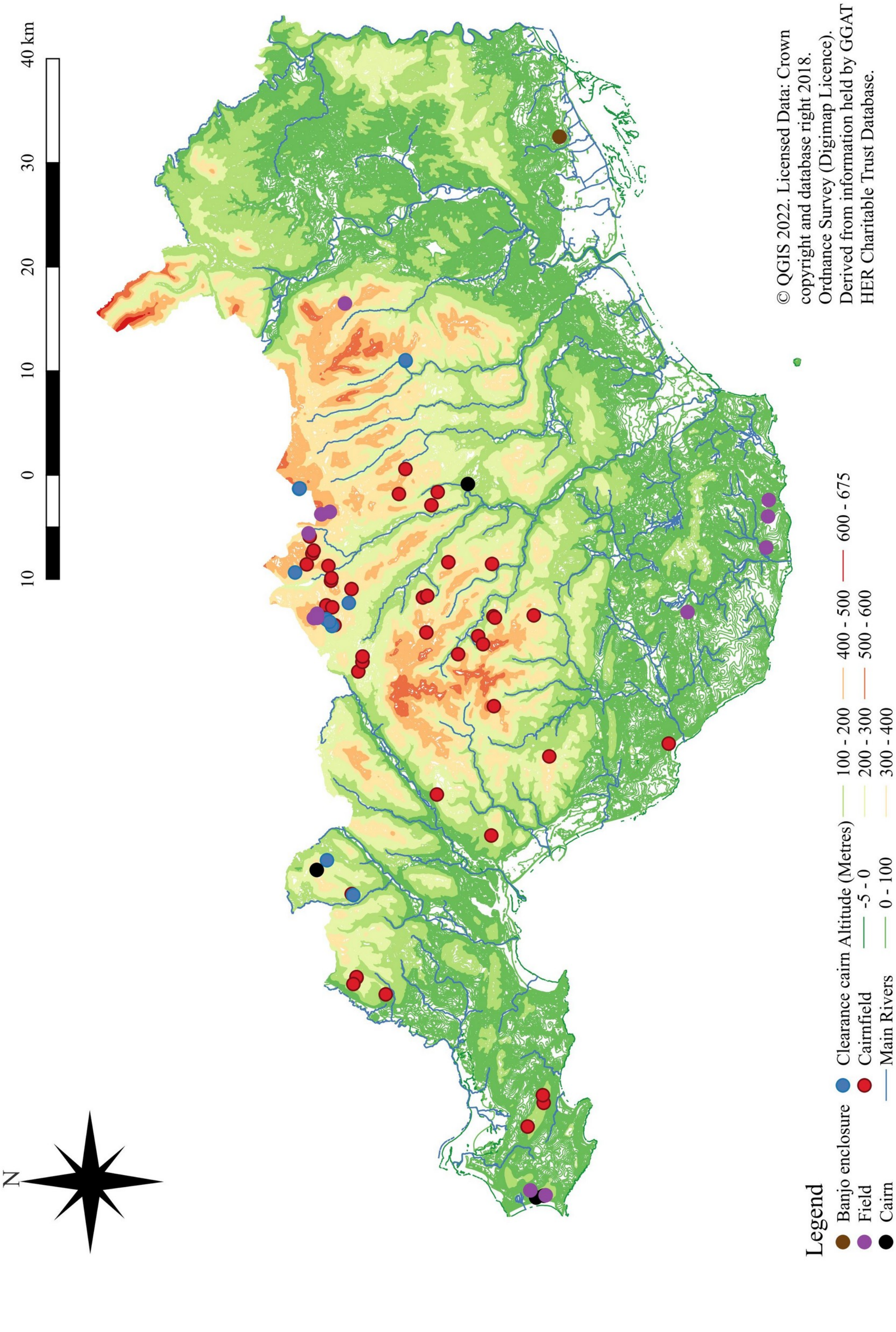
Figure 62: West of the region: Burnt mounds.



Evidence for agriculture (see Figure 63)

A potential Bronze Age exception to the absence of evidence for field boundaries, in the Gwent Levels, is at Newhouse Park, Chepstow, in the form of an enclosure or field boundary (Robic and Ponsford 2007, 130; and Robic and Ponsford 2008, 70 and 130; and Bell *et al.* 2013, 294). The evidence for this assertion is limited though, in that it constitutes a section of ditch. The presence of cattle would lead one to presuppose that a

Figure 63: Field systems and boundaries (including a potential banjo enclosure), and clearance cairns, southeast Wales.



field system would be present or at least a corral, if the area were occupied intensively rather than just being subject to transhumance practices.

On Gray Hill, a field system (GGAT 01005g) is present that may date to the Bronze Age (Hamilton 2004, 103; Makepeace 2006, 67; and Bell *et al*. 2013, 322). The HER refers to the site as a prehistoric enclosure, although the summary states that the site was subdivided into small fields. Several potential field boundaries and systems (see Figure 62) have also been identified within the HER, such as Cwm-Cidy West in the Vale of Glamorgan (GGAT 02925s). However, their presence is sparse in the coastal margins, with four in the Vale of Glamorgan and just two on Gower. A particular concentration can be observed, though, in conjunction with clearance cairns and cairnfields (seebelow), with the Taff Fawr Valley at its centre, which also featured in the k-means analysis for the settlement sites in the area. As previously stated, this area probably falls within Brecknockshire, although spatially it is within the remit of this thesis.

As previously observed, the absence of fields does not necessarily equate with a pastoralist society, contrary to the assertions of some.

Clearance cairns and cairnfields

Sorting through the data proved problematic as the HER, on occasion, identified some cairn sites as funerary but were then allocated to the 'Broad Class' category, as agriculture and subsistence; for example, Rhos Gwawr cairn cemetery and a cairn/round barrow, Rhossili Down (GGAT 00030m and 08095w respectively). Given their potential to have had a ritual function, at least occasionally, the area's LCPs were overlain (see Figure 64). In cases where there was some ambiguity regarding the site's status, caution was exercised, and the respective sites were removed from the dataset of this thesis. Others have differentiated between a rock stack and a cairn (Cripps 2007, 230), although the HER does not provide this level of differentiation. The terms cairn and clearance cairn appeared to be used interchangeably in the HER, although there was a preponderance for the term clearance cairn. Where such cairns were close to clearance cairns, their broad class status was changed to bring it in to alignment with the adjacent monuments. Cairns were removed from the dataset when:

Figure 64: Clearance cairns and cairnfields, southeast Wales.

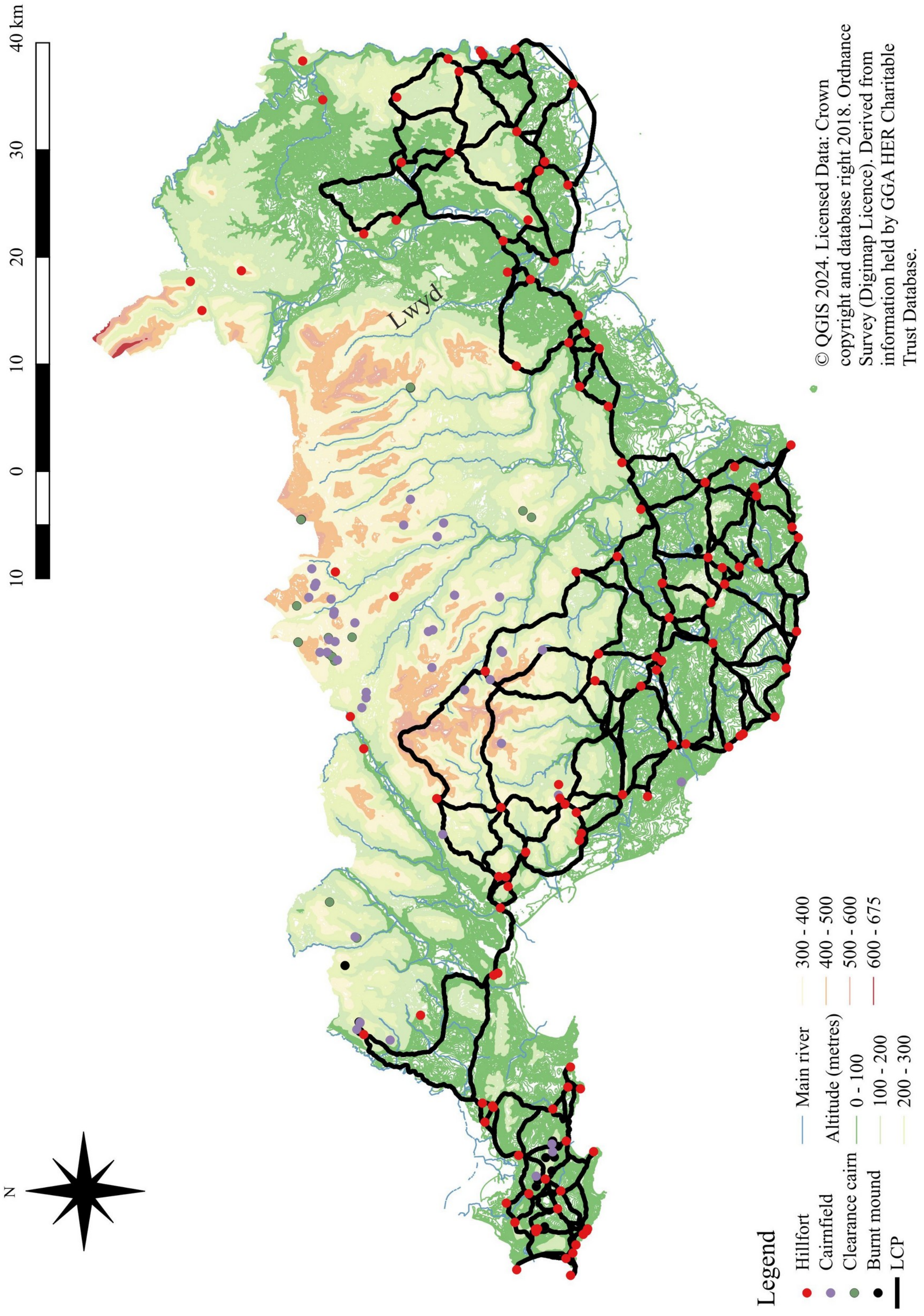
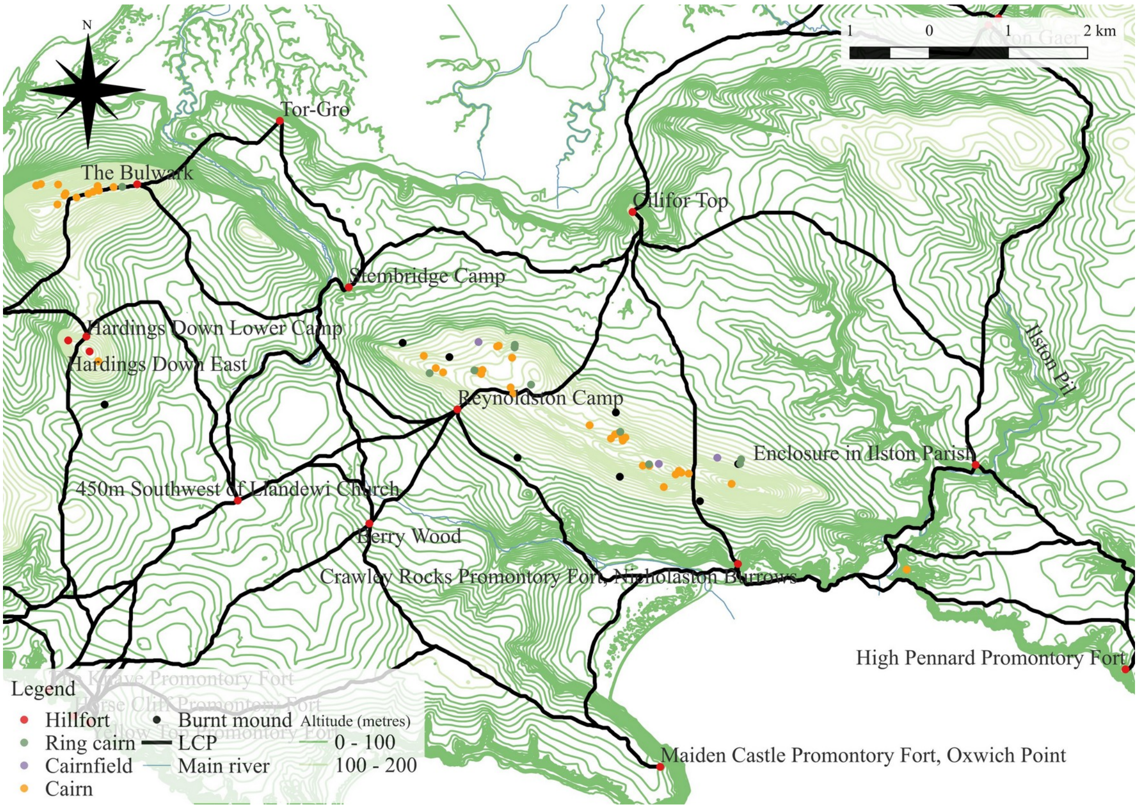


Figure 65: Cefn Bryn Cairns, cairnfields and burnt mounds, Gower.



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1. It was an isolated cairn, such as Pentwyn Mound (GGAT 08159m).
2. Subsequent assessments indicate a different purpose. For example, Mynydd Uchaf Cairn (GGAT 00478w) was removed from the dataset, as a recent site visit conducted in 2003 describes the presence of a bank and ditch with, potentially, an original revetment being present, which would be more in-keeping with a funerary monument (Pearson and Sherman 2003, 39).
3. Should the site have been destroyed by quarrying, for example, and the original land surface does not exist from which to take measurements.

This evidential dataset was particularly problematic for the above reasons and the fact that such cairns are often sited adjacent to funerary sites. There also appears to be an association with burnt mounds at Cefn Bryn, Gower and Graig Fawr (see Figures 62 and 66, respectively), which may indicate that cairns served other functions, at least in some areas. Invariably, clearance cairns have been assigned to the Bronze Age or just described as being prehistoric; whilst in Cornwall, excavations at Gold Park found timber structures of a later Iron Age date beneath a cairnfield, which it was intimated was also of a late Iron Age date (Cripps 2007, 148). This would indicate that caution should be exercised when ascribing them to any given period without the assurance of absolute or relative dating.

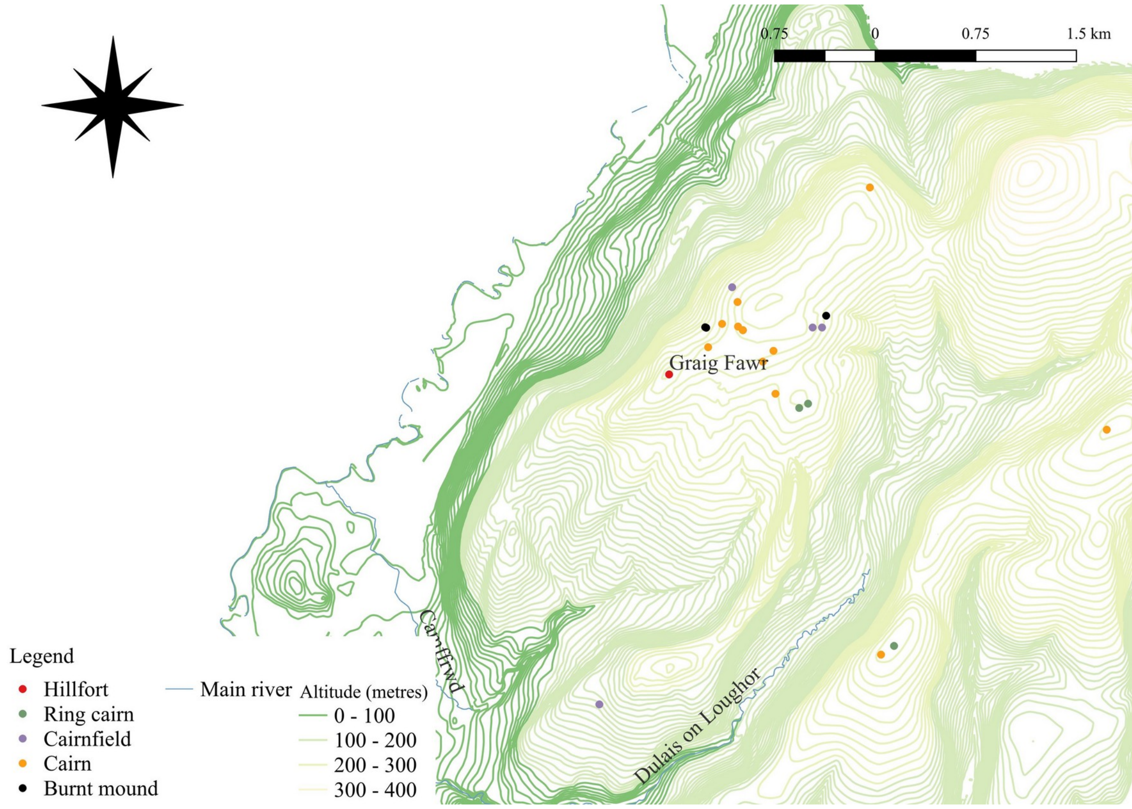
Given the inhospitable location of many of these clearance cairn sites in southeast Wales, they likely resulted not from an effort to clear rough grazing but facilitated other functions. Cripps (2007, 148) opines that:

> As such they may have acted as significant nodal points in the socialisation of the landscape. Any conceptual partition of the landscape could have been made in reference to these foci, which would have acted as mnemonic devices to recall specific aspects of the oral tradition that governed social action.

Cairns in southeast Wales occupy prominent locations (see Figure 66), indicating monumentality by their presence adjacent to a break of slope; this then implies that the functional suggestion related to clearance is incorrect. They also come as pairs or lines in the landscape as if to emphasise their presence. Their prominence may have also facilitated the passage of people through the landscape by acting as a waypoint or waymark, as the ritual sites adjacent to the LCPs may have done in the south of the region. Cilifor Top's LCPs linking it Crawley Rocks and Reynolston Camp may not have crossed Cefn Bryn in late prehistory because of its sacred status, which also includes two Neolithic chambered tombs. However, such an aversion does not appear to have taken place adjacent to The Bulwarks.

A cairn's status, whether functional, in terms of clearance, or ritual as a funerary monument, could still have provided a waymark steeped in cultural significance for the area's inhabitants. As previously noted, there appears to be a concentration of settlements and agricultural sites centred upon the Taff Fawr Valley (see Figure 48). To the south of the Brecon Beacons, the cairns may have functioned similarly in that they could have provided a culturally significant navigable route to the spring pastures, located centrally within the Beacons.

Figure 66: Graig Fawr, cairnfield.



Conclusion

The evidence for settlements is more ephemeral when compared with that of hillforts or promontory forts, as they are smaller and less substantial by their very nature. In all likelihood, open settlements were the predominant settlement form in later prehistory, although evidence for them is rather limited, probably due to ploughing and other modern farming practices. The materials used in their construction may also explain their apparent differential survival depending on whether stone or wattle and daub was employed. Regarding the coastal margins, it is likely that there would have been a reliance on wattle and daub construction techniques.

A regular or uniform distribution, assuming contemporaneity, is considered to be representative of competitive interactions (Bevan and Conolly 2006, 218, and Hodder and Orton, 1976, 54 – 85). Such competitive interactions can result from a growing population resulting in the more dense occupation of the region or the movement of people, due to climate change, from areas of marginality. It is highly likely that this position will be enhanced with the addition of currently unknown later prehistoric settlement sites. Given that Gower appeared as a discrete cluster in all the various iterations of the k-means statistic and when combined with the viewshed analysis would indicate a discrete cluster possibly representing differing socioeconomic practises, possibly as a result of a greater emphasis on fishing, here. Interestingly, the viewshed analysis for the Vale of Glamorgan also indicates a degree of discreteness for promontory forts, when compared with those hillforts just a short distance in land from them, and this again may reflect maritime influences. The clusters generated may also reflect socio-political expressions of identity, such as the loose federal structure for the Silures proposed by Lancaster (2014). Hillforts, outside the areas already mentioned, were predominantly located in the more agriculturally fertile lowland areas of the region and therefore fell into the respective clusters generated here. Somewhat surprisingly the clusters generated appeared to respect rivers that often formed the boundaries for preserved counties of the region, perhaps indicating their longevity as such.

Agricultural practises in later prehistory in southeast Wales appear to preclude the necessity of having field boundaries, as there are very few within the region. Some have presumed that the absence of such field boundaries indicates the prevalence of pastoralism within the region, as observed in Chapter 5. Open field systems can co-exist with pastoralism, as evidenced by open field systems present during the mediaeval period. Clearly pastoralism had a role in the agrarian economy of the time, and upland areas would have been utilised for grazing later in the agricultural year than the Levels. To this end, a group of settlement sites and clearance cairns/cairnfields are concentrated near Llwyn-onn. A route between Brecon and this area would have been facilitated by the Taff Fawr Valley or Sarn Helen a Roman road in an adjoining valley immediately to the west. The importance of the latter is demonstrated by the presence of monuments here including Llech Llia henge (CPAT 238), Maen Llia standing stone (CPAT 3225), cairns and settlements such as Fan Llia. These routes would indicate that the area had links with Brecknockshire, given its proximity. Such liminal areas of the region often allow one to understand the host region more clearly in terms of its interactions with neighbouring regions, as opposed to the central area that is somewhat divorced from the periphery by it its very nature.

Herzog (2014) opines that paths were formed over considerable periods and were not generated by an individual but by the passage of many feet, which had cultural relevance to the people who generated them; as such, one would expect them to acquire features of cultural significance over time. Redland standing stone, one such feature, is located at or near an intersection of two LCPs (see Figure 58), to the northwest of which is Cottrell Park standing stone; both would have had, in all likelihood, cultural significance for people traversing these routes in later prehistory. The presence of ritual sites adjacent to these paths would facilitate a local/regional identity by providing a constant reminder of one’s links to the past or for a visitor that the land was steeped in the ‘history’ of those who resided here. These monuments are strong indicators of the LCPs longevity in the landscape, as presumably they were located here to ensure an audience by the simple premise of people using the path. The actual route taken by later prehistoric people may not have followed that generated by an algorithm precisely but incorporated or avoided such sites of cultural significance. Nevertheless, the presence of such sites on or adjacent to the generated LCPs would indicate the validity of this approach.

The importance of routeways through the later prehistoric landscape is brought into sharp focus by the presence of sites along or adjacent to LCPs, as demonstrated in one of the ‘blank areas’ identified by Davis (2017, 331) around Llandow and Wick, where an LCP passes between two sites where there is evidence of later prehistoric occupation. Ringland Top, another potential site, indicates that the scrutiny of areas adjacent to LCPs merits closer analysis. Such analysis would lend itself to either a ‘citizen science’ project or the use of Artificial Intelligence in order to identify sites. These routes would have linked the later prehistoric landscape of southeast Wales and beyond, but at the local level, provided the means to link neighbouring settlements.

Although burnt mounds were identified in the HER as domestic, this would appear inaccurate given their siting in locations such as Graig Fawr and around Cefn Bryn, Gower; they should probably be recategorised as religious or ritual. These locations appear to have had significance for later prehistoric peoples and, in the case of Graig Fawr, could not be a more conspicuous location when viewed from Dyfed. The juxtaposition of burnt mounds and clearance cairns combined with a topography that affords them prominence in the landscape would indicate the significance of this location, perhaps as a boundary between 'Gower' and that of the neighbouring western peoples, as it does to this day, albeit the boundary is a little further west following the course of the Loughor river, whilst topographical features define the northern boundary. Clearance cairns appear to have served a variety of functions, such as being waymarks or delimiting a territory, given their prominent locations and were not just the result of functionalist clearance. They prove problematic as the HER is sometimes contradictory about their status, given their similarity to other monuments. Furthermore, given that the areas would have been primarily utilised for rough grazing, it strongly suggests that clearance was not the prime motivational factor in their creation; their proximity to LCPs also indicates that this was the case.

Chapter 10: Conclusions and critical review

The region was selected for a number of reasons, including the need for a detailed study here, as identified by the Research Framework for Wales. Gale (2010, 2) observed that one must determine how the land was used to fully understand the role of sites and hillforts from a societal perspective, and, furthermore, how settlements were integrated with various features in the landscape (Review of the Research Framework for the Archaeology of Wales Responses to Research Framework Questions, 2010). To this end, it was necessary to identify how people moved through the landscape, perceived it and interacted with it. Although this may be perceived as somewhat basic, it is at this level that later prehistoric people would have primarily interacted with the region.

In utilising the modern region of southeast Wales, the region also incorporated parts of the former county of Brecknockshire. As such, this leaves the northern periphery of the region falling within another historic region. As such, it was necessary to consider how the region was integrated into the wider geographical area.

Research questions

At this juncture, it is worth reiterating the questions that this thesis aimed to answer:

1. What were the locational factors for settlements in the study area, such as proximity to water, underlying geology and topography?

2. How was the landscape structured/organised within the geographical context of southeast Wales during later prehistory?

3. What functions did hillforts perform in the region?

Although widespread, hillforts are not found everywhere in Britain and Ireland; whatever their function may have been, it was not universally required in later prehistory. As already intimated, hillforts, although associated with prime agricultural land, may have had other roles to play in later prehistory. Regarding their geographical spread in the region, they are present within the broader coastal margins, the Wye Valley, the region's northernmost area, and Brecknockshire.

Geographical considerations

Given the ready availability of water in the region, it was considered unnecessary to perform statistical analysis on its availability other than to buffer water sources to ascertain the proximity of sites to watercourses. Of all sites, c. 91% are within 500 m of a watercourse and 51% of those within 250 m. Cunliffe's (2005, 293) assertion, therefore, that settlements were located on valley sides to dominate watercourses seems implausible given the ready availability of water within the region. It is also based on the premise that the people here were primarily pastoralists, an assumption derived from the absence of evidence for fields, even though they may have been unnecessary regarding arable farming practises in later prehistory. Furthermore, later prehistoric people would have practised mixed farming, although the emphasis would have leant towards pastoralism at higher altitudes and in the Levels, due to their degree of marginality.

The chi-square statistic indicated a positive correlation between altitude and the location of sites. As Brown (2019, 33) observes, c. 89% of all hillforts in England and Wales are located below 300 m in altitude; for the region, the figure is 91.3%. Moreover, the majority, c. 82%, of hillforts in the region fall below 200 m altitude. This propensity to be sited at lower altitudes would indicate that their primary focus was the more agriculturally rich lowlands. Outliers, such as Pen Twyn (GGAT01713g) and Twyn Y Gaer (GGAT01607g), on either side of the mouth (east and west side, respectively) of the Vale of Ewyas had an altogether different role in later prehistory than their counterparts at a lower altitude. Their monumental presence either side of the entrance of the Vale of Ewyas would appear to be as gatekeepers of the vale particularly when Ysgyryd Fawr to the south is included.

Regarding settlements, something counterintuitive is at play here as settlements appear to decline in numbers up to 300 m; at this point, they increase. The zone of decline would be at the very level one would presume settlement should be at its most intense, given that the environmental conditions are more favourable. Figure 19 (Chapter 7) clearly demonstrates this absence of data for settlements in the 150 and 300 m altitude range, the evidence for which has been removed by modern farming practices. Hillforts show a steadier decline in numbers as altitude increases, likely indicative of what the numbers for agriculture and settlements should be showing.

A positive correlation between sites and soil texture was identified by the chi-square statistical technique. Sites tend to be located on Medium to light (silty) to heavy soils, accounting for 34.12% of the region's soils (see Figure 22, Chapter 7), followed by variants at the medium level of the soil texture spectrum. Such soils would likely have been productive in later prehistory for arable farming. Unlike those towards the siliceous end of the spectrum, these soil types would retain moisture. Sites above silica based soils could indicate leaching post-clearance of the climax vegetation that occurred in the Bronze Age. However, domestic sites (see Figure 21, Chapter 7) tend to occur on clay–silica based soils, otherwise known as loam, dependent on the presence of silt. A southerly aspect would complement this soil composition, although this analysis indicated only a tenuous link with aspect in terms of site selection. This aspect result should also be treated with caution due to the paucity of settlement evidence, particularly at lower altitudes. Additionally, cultural factors could be at play when selecting sites with a southerly aspect, as that demonstrated for roundouse entrances.

Agriculture

Agricultural practices in later prehistory did not appear to rely on field boundaries, as there are very few within the region. Some have presumed that the absence of such field boundaries indicates the prevalence of pastoralism within the region, as detailed above. Pastoralism clearly had a role to play in the agrarian economy of the time, and upland areas would have been utilised for grazing, possibly as common land, later in the year than the spring grazing in the Levels.

To counter the premise of a purely pastoral economy, querns have been found in both lowland and upland settings (Sudbrook Camp at 10 m and Twyn Y Gaer, Llanfihangel at 426 m, respectively) indicating arable farming was widespread (Howell and Pollard 2004, 151 – 53 and Lancaster 2012, 12). It is unlikely that cereals would have been viable at altitude, however, in later prehistory although barley is more resilient to the vagaries of climatic conditions (Campbell 2021, 68). Furthermore, greater weight is given to the widespread nature of cereal production evidenced by the cultivation of cereals found at Thornwell Farm, Chepstow and cereal grains at the midden site, Llanmaes, Vale of Glamorgan (Caseldine 2018).

Cairns were particularly problematic given that the HER gives contradictory reports about their status as a given monument type, probably because of their similarity to other monuments. Clearance cairns, often posited as resulting from the functional act of clearing land, seem an improbable explanation given that these locations are frequently only fit for rough grazing. Such cairns undoubtedly served various functions, including waymarks or territorial markers, given the deliberate selection of prominent locations for their erection, as evidenced at Graig Fawr. The presence of burnt mounds, tombs and a hillfort indicate the significance of this location and further undermines the agricultural clearance argument. In other locations, their proximity to an LCP also suggests something other than the purely utilitarian act of clearance.

Regional boundaries

Graig Fawr hillfort, adjacent to a steep escarpment facing into Dyfed, with high levels of visual coverage, is a significant declaration of one's presence here. It could not be in a more conspicuous location when viewed from the west. The presence of burnt mounds and clearance cairns here, emphasised by the topography, affords them prominence as a significant boundary between the region and the preserved county of Dyfed. The longevity of this liminal area is further demonstrated by the presence of Graig Fawr chambered tomb and round barrows that would also enhance a people’s claim to this locale. The Loughor and its associated estuary are south of this escarpment, forming a significant geographical boundary between the east and west, and form the current boundary between the region and Carmarthenshire.

The region’s eastern boundary runs up the Wye from the coast, terminating around the Gaer (GGAT00972g) and then runs westward via Great House Camp (GGAT00942g), Llancayo Camp (GGAT02166g), ending at Coed Y Bwnydd Camp (GGAT02171g), which form a band of high to moderate levels of visual coverage, including those hillforts on the west side of the Wye, with the Trothy or potentially the Monnow acting as northern boundary. To the north at the mouth of the Vale of Ewyas, as previously suggested, Pen Twyn (GGAT01713g) and Twyn Y Gaer (GGAT01607g) may have had a different role as a monument to impress the neighbours to the south in the main body of the region. North and east of the Monnow in England are three hillforts, Walterstone Camp, Penapark and Broadoak, which have good levels of visual coverage into the region that indicate their area of interest. The area centred upon Monmouth is more challenging to determine given the confluence of several rivers here, and it may be located at the junction of three regions. Mitchel Troy (GGAT08941g) is north of the Trothy and north of the Wye Little Doward, Herefordshire probably fell within another region again. Kymin Hill (GGAT01263g) lies to the east of the Wye and, although part of the modern region, given the high visual coverage to the west and its location, indicates that it would have fallen outside the region in later prehistory.

Regarding the northern boundary, there is a well-known cluster centred upon Brecon and several hillforts on either side of the Usk Valley, which follow the valley's course up to Brecon. Given that this appears to be a spur of the Brecon cluster, it is best placed within the Brecknockshire region and, in any event, falls outside the region. As does Craig Y Dinas (GGAT01107m) at the northern end of the Neath Valley with its high levels of visual coverage, but of limited extent, associated with the northern entrance to the Neath Valley. However, from a watershed perspective, it would be more appropriately placed in southeast Wales, as there are two hillforts present further north along the course of the Neath and several Iron Age enclosures; whilst on the northern side of the Black Mountains, there appears another discrete area of settlement. The cluster around Llwyn-onn is another liminal area on the periphery of two regions, but, again, from a watershed perspective, it is best placed within southeast Wales. Further data would have to be utilised from outside the region to determine this cluster's status vis-à-vis the region.

Nearest neighbour

On a note of caution, in terms of the following analysis, the distribution of hillforts is indicative of its actual distribution, whereas that for domestic sites reflects the availability of evidence, as opposed to their actual distribution. Due to the monumental nature of hillforts, it is unlikely that many new sites will be found in the region and, therefore, it should accurately reflect their distribution. The occupation level for settlement sites was probably far greater than the available evidence indicates, particularly considering the limited evidence in the region's coastal margins when compared with upland areas.

At the compound run of the statistic, which included all settlements and hillforts, a value of 1.16 was returned that would suggest an even distribution, corroborated by the Z score. An even or regular distribution of sites is thought to demonstrate competitive interactions, catchments or both scenarios (Bevan and Conolly 2006, 218, and Hodder and Orton, 1976, 54 – 85); however, this relies on the sites being contemporaneous. This result contrasts with that returned when sites and hillforts were analysed separately that indicated clustering. This clustering could indicate 'catchments' based on a limited resource, such as good agricultural land and the appearance of polities (Bevan and Conolly 2006, 218, and Roberts, 2003, 15 – 37). These results appear to show that the two types of site complemented one another spatially and would indicate a mature or saturated occupation level within the region.

Furthermore, given the time and effort invested in their construction, although not ruling out abandonment, there would be a desire to occupy such sites for as long as possible. A person would psychologically identify with their home, including the surrounding area, with it then becoming an aspect of their identity. As such, Caerau (GGAT00093s), Ely was a centre of occupation from the Late Bronze Age/Early Iron Age to the 1st Century BC (Davis 2017, 335, and Sharples and Davis 2020, 175). Smaller enclosed sites have been considered occupied for one or two centuries, with periods of apparent abandonment. However, this should be treated with caution due to the potentially unreliable ceramic evidence (Davis 2017, 335). Additionally, the limited number of known and excavated sites make such a premise unreliable for Glamorgan, which could also be true for Gwent. If Caerau is indeed typical, then the evidence for continuity rather than discontinuity of occupation would be significant.

Intra-regional boundaries

K-means was utilised to determine the optimum number of clusters in determining the region's internal boundaries for later prehistory, albeit the modern geographical region constrained the analysis.

In all the various k-means iterations, Gower remained a discrete entity, although it did expand and contract to varying degrees, with the Loughor on its western margins forming a natural boundary with Dyfed to the west. This area may define the western boundary of Gower to the north and the Loughor River to the south; whilst the eastern boundary defined by either the Tawe or Neath valleys in later prehistory. It would appear that k-means supports the separate nature of Gower and indicate that a different socieconomic pattern was prevalent here. A view further supported by the virtual absence of hillforts over 1.2 ha. other than Cill Ifor Top (GGAT 00233w), and may indicate a greater dependence on fishing and differing farming or cultural practises present here. Its identity, as an entity, is amplified by the network of LCPs present here and the high viewshed coverage within the area. The orientation of this coverage would indicate that there was a strong maritime interest here, presumably for fishing.

Within the central coastal margin, visual coverage orientation becomes more complex and ‘thins out’ adjacent to some rivers like the Garew and Usk. South Glamorgan’s promontory forts are visually discrete from those hillforts inland and may again reflect differing socioeconomic traditions, such as a reliance on fishing given their proximity to the sea. There are high levels of visual coverage centred upon the inland hillforts, but a lack of integration with the coast. When compared with Gower, this absence of integration is in marked contrast, as Gower appears more unified. Gwent's visual coverage, however, falls short of the coast proper to an area within the Levels, which would have been marsh in later prehistory. This marshy area, extending into South Glamorgan may have been considered a liminal area that was deemed unnecessary to assert a claim upon though and therefore treated as common land.

The orientational preference of visual coverage can also be observed concerning Maendy Camp and Gwersyll Enclosure (see Figure 44, Chapter 8), located in their respective valleys through which the Rhondda Fach and Cynon flow. Gwersyll Enclosure falls into a northern cluster, with its high visual coverage to the southwest and poor coverage of the Taff to the northeast. Whilst Maendy Camp, with high visual coverage to the northeast, covering Rhondda Fawr, potentially belongs in a cluster to the south.

Paths

How people passed through a landscape is key to understanding how the region functioned both intra and inter-regionally. It is this simple act which facilitates markets, religious festivals, etc. and, as such, is fundamental to understanding the interactions of later prehistoric people in the course of their lives. Hillforts, when buffered at 3.22 km (c. 2 miles), were usually in the vicinity of at least two other hillforts, and therefore, a short walk of half an hour would have seen an individual arrive at their neighbours. Cunliffe (2005, 293), however, opines that the north-south flowing rivers in the coastal margins of the region made communication difficult between the resulting blocks, but did not appear to consider the role that fords played in such a network. The LCP network appears to 'narrow' at potential fording points, and a number of such points were identified (see Table 8), which related to areas of riffles visible on Google Earth. Additionally, fords recorded in the HER were utilised to indicate the potential for fords in later prehistory. Furthermore, perhaps with the exception of Gower, the presence of rivers does not appear to have unduly affected the cohesiveness of the region in later prehistory.

LCPs were drawn between hillforts to try and replicate the routes taken by people between neighbouring sites and should be seen as part of a continuum of routes flowing through southeast Wales, linking it with other regions. Some consider the hillforts may have acted as signposts or waymarks and acted as 'trading nodes' (Condit and O'Sullivan 1999, 35; Brown 2009, 201; Driver 2013, 59; and O'Driscoll 2017a, 73 and 2017b, 514). Given that a path would be generated over considerable periods by the passage of many people, they would acquire a cultural significance to those who used them (Herzog 2014). One such example is the Redland standing stone, located at or near a crossroads of two LCPs (see Figure 59, Chapter 9), to the northwest of which is Cottrell Park standing stone; both would have had, in all likelihood, a cultural significance for people traversing these routes and were located here to reinforce a sense of identity. The actual route taken by later prehistoric people may not have followed that generated by an algorithm but incorporated or avoided sites of cultural significance along its route, the secular and religious may be inseparable here. Nonetheless, the presence of significant sites on or adjacent to the generated LCPs would indicate the validity of this approach.

The LCPs generated would indicate the presence of four distinct clusters, Gwent, Glamorgan and Gower, in the southern coastal margin of the region, demarcated by the Rhymney and the Neath/Tawe, which corroborates the results of the k-means analysis. The northern group of settlement sites and clearance cairns/cairnfields concentrated near Llwyn-onn are on a potential later prehistoric route between Brecon and the region by the Taff Fawr Valley and Sarn Helen. Looking closely at these peripheral areas of the region gives an opportunity to understand inter-regional communication. For example, sited at the northern end of the Vale of Neath, Craig Y Dinas and Glyn Neath (GGAT00551w) have high visual coverage primarily of the valley floor, whilst Carn Caca has good coverage of the western side of the valley. The high visual coverage at either end of the Neath Valley is a strong indicator of a route to and from the interior of Wales, which possibly also demarcated the region's boundary with Gower.

Hillfort monumentality

Monumentality, as already indicated, was a significant feature of later prehistoric life, clearly demonstrated by the presence of Gaer Fawr hillfort and other prehistoric monuments. Again, in terms of monumentality, hillfort entrances in the region appear to have a preference for either a northeast or southwest orientation, although a number have entrances aligned to the east or southeast, which accords with that of roundhouses in Wales (Ghey *et al*. 2007). With roundhouses this entrance orientation, i.e. south to east orientation, was only prevalent during the Late Bronze Age and Early Iron Age (*ibid.*). It would be intriguing to determine the date of hillfort entrances in southeast Wales to ascertain whether they coincide with that of roundhouses. This may also be another facet of 'morphological direction', as espoused by Murray, whereby the observer's attention is drawn to specific features of a hillfort (2019, 117).

Research recommendations

This research inevitably raised further questions whose answers would expand upon this initial work:

1) Given the gargantuan scale of the task involved, Artificial Intelligence should be employed to scrutinise the LCPs generated and their adjacent areas. The presence of sites, such as Hartridge Farm Road and Brychau Roman villa, on or near to these LCPs demonstrate the value of this approach, as does the presence of prehistoric monuments.

2) The danger of using a region means that the research was inevitably subject to edge effects, by extending the area beyond that of the core region will assist in our understanding of how they may have interacted. Of particular interest are: the line of hillforts extending up the Usk valley to Brecon; the region's eastern boundary, the Wye; the area to the north of Llwyn-onn; and the western margin beyond Graig Fawr into Dyfed.

3) Given Maddison's work with percolation analysis and that there appears to be some corroboration, in terms of the results generated, between these approaches

(i.e. k-means) demands further work. This author has already reached out to him with the view of participating in collaborative work comparing these and other approaches to the dataset. Furthermore, clustering could be undertaken employing other parameters for filtering the data that include vallation or entrance orientation.

4) As with Campbell's (2021, 212) recommendation, further work needs to be undertaken on establishing a chronology for hillforts in Wales, which will then assist in establishing timelines for their construction. In turn, by having dates for their of construction will allow for the testing of theories regarding what may have initiated their widespread construction.

5) Lock and Ralston (2022, 247 and 311), as previously noted, have determined that only a third of hillforts that have been excavated within the innermost boundary have evidenced the presence of roundhouses. To determine whether this is representative of the region will require detailed scrutiny of the available aerial photography and DSM, as it is unlikely that they will all be excavated or subject to thorough survey.

6) The dryland periphery of the Levels would be an obvious place to research levels of later prehistoric occupation. In doing so, we may obtain a better understanding of how this area was used. Such a location, on the periphery, would allow for the ready exploitation of the Levels in the spring. The Welsh word Hendref, which means winter dwelling, is evidenced by the former presence of Hendre Farm, adjacent to Ringland Top, and indicates how the Levels would have been exploited in historic times here.

This thesis should be viewed as a start to looking at the later prehistoric occupation of the region. The data produced, such as LCPs and the polygon's for hillforts, is a resource that may be utilised by other researchers to build upon and probably come to differing conclusions to the author of this paper.

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Historic England: https://historicengland.org.uk/

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International Council on Monuments and Sites: https://www.icomos.org/en

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Royal Commission on the Ancient and Historical Monuments of Wales: https://rcahmw.gov.uk/

UK Grid Reference Finder: https://gridreferencefinder.com/

Appendix A: Soil structure (weathered)

PM_DIC_WEATHERED_STRUCTURE	
STRCTR_WTH CODE	DEFINITION
GRAVEL_(CLAST_SUPPORTED)	DISAGGREGATED GRAVEL 2.0 - 600MM IN DIAMETER, LITTLE INTERGRANULAR MATRIX
GRAVEL_(CLAY_MATRIX_SUPPORTED)	ROCK FRAGMENTS/STONES WITH SUBORDINATE ARGILLIC-MATRIX
GRAVEL_(SAND_MATRIX_SUPPORTED)	ROCK FRAGMENTS/STONES WITH SUBEQUAL ARENACOUS MATRIX
GRAVEL_(SAND_MUD_MATRIX_SUPPORTED)	ROCK FRAGMENTS/STONES WITH SUBORDINATE ARGILLIC TO ARENACEOUS MATRIX
MATRIX_CLASTIC_HETEROGENEOUS	HETEROGENOUS UNIT WITH VARYING ZONES OF MATRIC CLASTIC DOMINANCE
MUD_MATRIX(PLASTIC)	SOFT/PLASTIC ARGILLIC MATRIX (NO ROCK/STONE CONTENT)
MUD_MATRIX_WITH_GRAVEL	DOMINANT ARGILLIC-ARENACEOUS MATRIX WITH SUBORDINATE ROCK FRAGMENTS/STONES
ORGANIC_MATRIX	DOMINANT ORGANIC MATRIX (NO ROCK/STONE CONTENT)
SAND_MATRIX	ARENACEOUS MATRIX (NO ARGILLIC COMPONENT AND NO ROCK FRAGMENT OR STONE CONTENT)
SAND_MATRIX_WITH_GRAVEL	ARENACEOUS MATRIX (NO ARGILLIC COMPONENT) WITH A SUBORDINATE ROCK FRAGMENT OR STONE CONTENT)
SAND_MUD_MATRIX	DOMINANT ARGILLIC-ARENACEOUS MATRIX (NO ROCK FRAGMENTS)
SAND_MUD_MATRIX_WITH_GRAVEL	DOMINANT ARGILLIC-ARENACEOUS MATRIX (SOME ROCK/STONE CONTENT)
SAND_MUD_MATRIX_WITH_REMNANT_GRAVEL	DOMINANT ARGILLIC-ARENACEOUS MATRIX WITH VERY SUBORDINATE AND DEGRADED ROCK FRAGMENTS/STONES
UNKN	UNKNOWN

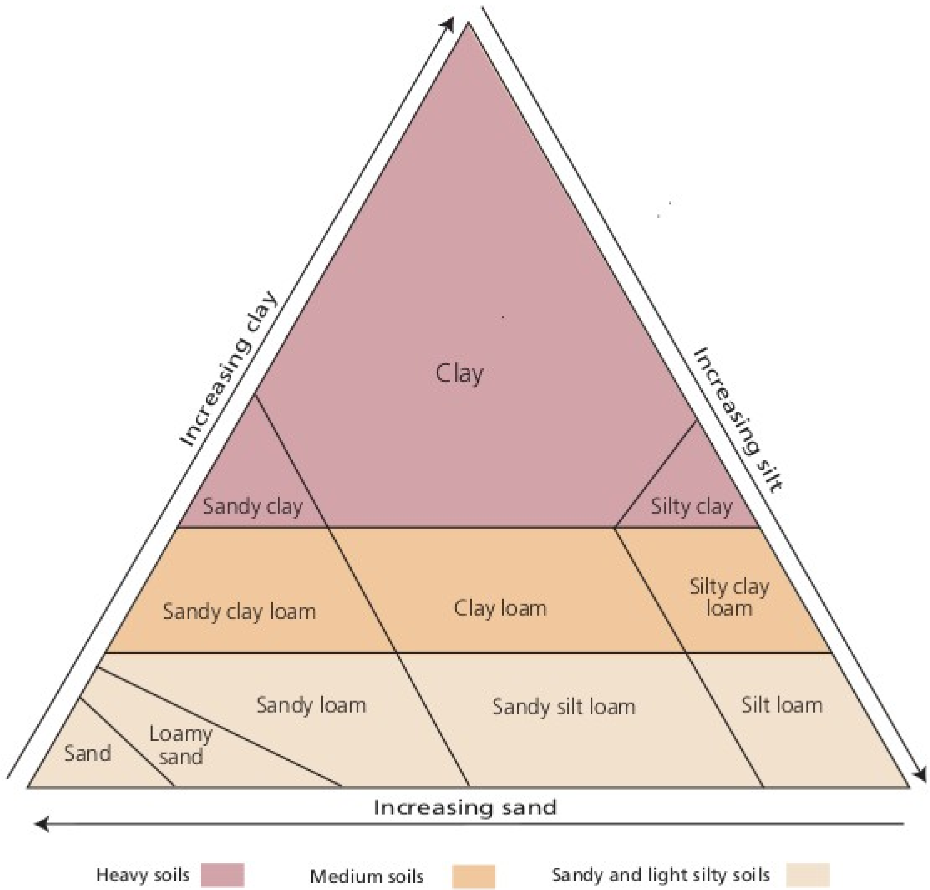
(Source: Lawley 2011, 40)

Appendix B: Dominant Mineralogy

D_MN_ CODE	DOM_MNRL class	DOMINANT MINERALOGY DEFINITION
?	UNKNOWN	BULK MINERALOGY IS UNKNOWN
A	ACID	IGNEOUS ROCKS WITH HIGH SILICA (63%+)
B	BASIC	IGNEOUS ROCKS WITH LOW SILICA (45-52%)
C	CLAY	DOMINANT CLAY MINERALS (90%+)
D	MGCARBONATE	DOMINANT MgCaCO3 (with SOME CaCO3)
E	EVAPORITE	PREDOMINANTLY SULPHATES AND HALIDES
F	FERROAN SILICATE-FERROAN CARNONATE	DOMINANT Fe SiO2 OR Fe-Mg/CaCO3
G	CACARBONATE-MGCARBONATE	DOMINANT CaCO3 (60%+) SUBORDINATE MgCaCO3 (40%-)
H	MGCARBONATE-CACARBONATE	DOMINANT CaCO3 (60%+) SUBORDINATE MgCaCO3 (40%-)
I	INTERMEDIATE	IGNEOUS ROCKS WITH MOD SILICA (52-63%)
J	SILICA-CACARBONATE	DOMINANT SILICA (60%+) SUBORDINATE CaCO3 (40%-)
K	CACARBONATE-SILICA	DOMINANT SILICA (60%+) SUBORDINATE CaCO3 (40%-)
L	CACARBONATE	DOMINANT CaCO3 with SOME CaMgCO3
M	CLAY_CACARBONATE	DOMINANT CLAYS (60%+) SUBORDINATE CaCO3 (40%-)
N	CACARBONATE_CLAY	DOMINANT CaCO3 (60%+) SUBORDINATE CLAY (40%-)
O	ORGANIC	DOMINANT ORGANIC MATERIAL (90%+)
P	MGCARBONATE-SILICA-CLAY	DOMINANT MgCaCO3 (60%+) SUBORDINATE SILICA-CLAY (40%-)
Q	SILICA_CLAY	DOMINANT SILICA (60%+) SUBORDINATE CLAY (40%-)
R	CLAY_SILICA	DOMINANT CLAYS (60%+) SUBORDINATE SILICA (40%-)
S	SILICA	DOMINANT SILICA (90%+)
T	CACARBONATE_SILICA-CLAY	DOMINANT CaCO3 (60%+) SUBORDINATE SILICA-CLAY (40%-)
U	ULTRABASIC	IGNEOUS ROCKS WITH VERY LOW SILICA (45%-)
V	CLAY-SILICA-CACARBONATE	DOMINANT SILICA &CLAY (60%+) SUBORDINATE CaCO3 (40%-)
W	-SILICATE-MGCARBONATE	DOMINANT SILICA-CLAY (60%+) SUBORDINATE MgCaCO3 (40%-)
X	MIXED	BULK MINERALOGY IS VARIABLE DUE TO LITHOLOGY
?	NA	NO APPLICABLE MINERALOGY

(Source: Lawley 2011, 40)

Appendix C: Simplified soil triangle



(Source: Defra 2006, 42)

Appendix D: Critical values on the chi-square distribution

Significance Level

v	0.1	0.05	0.01	0.005	0.001
1	2.71	3.84	6.64	7.88	10.83
2	4.6	5.99	9.21	10.6	13.82
3	6.25	7.82	11.34	12.84	16.27
4	7.78	9.49	13.28	14.86	18.46
5	9.24	11.07	15.09	16.75	20.52
6	10.64	12.59	16.81	18.55	22.46
7	12.02	14.07	18.48	20.28	24.32
8	13.36	15.51	20.29	21.96	26.12
9	14.68	16.92	21.67	23.59	27.86
10	15.99	18.31	23.21	25.19	29.59
11	17.28	19.68	24.72	26.76	31.26
12	18.55	21.03	26.22	28.3	32.91
13	19.81	22.36	27.69	30.82	34.55
14	21.06	23.68	29.14	31.32	36.12
15	22.31	25	30.58	32.8	37.7
16	23.54	26.3	32	34.27	39.29
17	24.77	27.59	33.41	35.72	40.75
18	25.99	28.87	34.8	37.16	42.31
19	27.2	30.14	36.19	38.58	43.82
20	28.41	31.41	37.57	40	45.32
21	29.62	32.67	38.93	41.4	46.8
22	30.81	33.92	40.29	42.8	48.27
23	32.01	35.17	41.64	44.16	49.73
24	33.2	36.42	42.98	45.56	51.18
25	34.38	37.65	44.31	46.93	52.62
26	35.56	35.88	45.64	48.29	54.05
27	36.74	40.11	46.96	49.65	55.48
28	37.92	41.34	48.28	50.99	56.89
29	39.09	42.56	49.59	52.34	58.3
30	40.26	43.77	50:89	53.67	59.7
40	51.81	55.76	63.69	66.77	73.4
50	63.17	67.51	76.15	79.49	86.66
60	74.4	79.08	88.38	91.95	99.61
70	85.53	90.53	100.43	104.22	112.32
80	96.58	101.88	112.33	116.32	124.84
90	105.57	113.15	124.12	128.3	137.21
100	118.3	124.34	135.81	140.17	149.45

Degrees of freedom (v)

(Source: Wheeler, Shaw, and Barr 2004, 306 – 7)

Appendix E: Hillforts (101 records)

PRN	Name (Entrance orientation)	Summary	X	Y	Approx. area maximum extent and inner (ha.)
00005g	The Mount: Pen-y-Lan	Earthwork encircles the summit of a small hill which is situated in fairly low-lying ground, with no strong natural defences.	325850	184870	1.02* 0.4*
00022w	Burry Holms Hillfort (E)	A rampart and ditch cut across the island at almost the highest point, and enclose about a third of its area. The ditch is 6 ft deep in solid rock and the rampart, 15-20 ft high, is higher on the N side and some 4 ft above the interior of the fort.	239880	192580	0.76 0.58
00025w	Hardings Down West Camp (NE)	Occupies the spur at the W end of the isolated hill of that name, which rises to a height of about 150 m above OD about 1km SE of Llangennith. Summit also partly enclosed by an unfinished fort and small univallate enclosures lies on the upper N and lower.	243430	190780	1.52 0.46
00027w	Hardings Down Lower Camp (NE)	North Camp	243660	190830	0.47 0.12
00028w	Hardings Down East Camp (E)	The summit of the Down is partly surrounded by the unfinished defences of a fort similar in general character to that 250 m to the W (687) but larger; the are enclosed was about 0.9 ha. Present appearances suggest that the banks were carried out almost to	243700	190640	1.43 0.67
00029w	The Bulwark (E)	A hill-slope fort consisting of several lines of defence located at the eastern end of Llanmadoc Hill.	244300	192750	2.67 0.87
00039g	Rhiwderin	Small, roughly circular earthwork,	326400	187730	0.74

	Camp	consists of a bank with no visible ditch, which encircles the top of a small hillock in undulating low-lying ground.			0.32
00049g	Tredegar Hillfort (SE)	Multivate hill-fort with widely spaced ramparts on S. possibly indicating 2 periods of construction. Ring-motte with sub rectangular bailey within the fort.	328950	186840	6.08 1.04
00053m	Maendy Camp (SE)	Iron Age hill fort. Total area is about 9 ha. Low cairn & 9 smaller mounds are scattered over the site, but no structural connection to indicate their age.	295730	195510	1.19 0.19
00057g	Y Gaer: Graig-y-Saeson (E & W)	Small bi-vallate hill-top camp. The strength of the rampart indicates that this was a defensive earthwork & the construction seems typical of an Iron Age fort.	327330	186200	1.42 0.39
00090w	Tor-Gro	NE of Cheriton. At the highest point on this ridge, near the E end and 80 m above OD, a modern field-boundary follows the crest of an earlier bank, about 6m wide and nearly 2m high on its SW side.	246100	193550	0.57 0.33
00091w	Stembridge Camp (SE)	Stembridge Promontory fort occupies level ground at about 40 m OD overlooking a steep-sided valley and lying in an angle which provides natural defences on two of its three sides. The W and SE sides are roughly straight, 55 m and 51 m long respectively.	246970	191450	0.59 0.16
00093s	Caerau Camp (E & SE)	The fort occupies the W tip of a fairly extensive plateau rising to about 75 m OD. The old parish church stands within it.	313350	175000	9.01 4.93
00114g	Twm Barlwm (SW)	Summit is a flat oval shaped surface with a tumulus on the highest part. Entrance is NE, from which a trench is carried round the brow of	324217	192611	5.28 3.61

		the eminence.			
00116m	Y Bwlwarcau (E)	Innermost enclosure is pentagonal, area about 0.3 ha, protected by a substantial bank, ditch & counterscarp bank about 18 m wide overall; entrance in the E.	283880	188550	8.43 0.29
00153m	Mynydd Twmpathyddaer	Owing to quarrying & other disturbances, very little is now visible of what was once a roughly circular enclosure, about 120 m diameter surrounded by ditch.	284050	180370	1.37*** 0.54***
00159w	Berry Wood (NE)	A double ringwork stands S of Knelston at about 55 m above OD in enclosed land with a very slight fall to the NE. The banks are roughly circular but not concentric since they are almost contiguous on the E.	247230	188470	0.42 0.05
00160w	450 m southwest of Llandewi Church (N)	The site is on level enclosed land at about 55 m O.D. A much ploughed down enclosure measures, between the approximate crests of the bank, 44 m from E. to W. By 39 m, area about 0.1 ha.	245570	188760	0.47 0.16
00161m	Pen Y Castell (SE)	Small fortified enclosure at the W end of a low lime- stone ridge. About 30 m of interior has been removed by quarrying from the W end.	284220	182700	1.5 0.51
00161w	Reynoldston Camp (S)	A round enclosure, about 55 m in diameter, stands at 100 m above OD on ground falling gently to the S; the area is about 0.2 ha. It is defended by a spread bank with external ditch. The overall width of the defences is about 20 m; the bank rises 0.5 m above	248340	189910	0.57 0.14
00189s	Craig Tan-y-Lan (SW)	Smaller Univallate Fort. A spur about 90.0 m OD is fortified by a rampart about 110 m long and convex outward across it S end.	295850	179540	1.64 1.13

00192s	St Mary Hill Down (SW)	The earthwork stands at about 90 m OD on ground falling to the NE. The position is not naturally defensible. The enclosure, area 0.2 ha, and is almost circular.	296720	179050	0.63 0.25
00193s	Mynydd Ruthin	Two sections of bank, situated on a plateau with a very slight slope to the south and no natural defence, extensively damaged by quarrying activity, now disused and under grass. The adjacent farm has the possibly significant name of Pen-y-gaer.	297090	179590	No OS, DTM or GE detail to extract polygon from.
00198w	Pen-y-Gaer (W)	The earthwork is defended by steep natural slopes in the north and south while across the easy approaches in the west and east, a single bank has been constructed. The bank deteriorates to a scarp in the north and south.	253650	195540	1.14 0.76
00220g	St Julians Wood Camp	A small sub-rectangular hill slope enclosure	333997	189081	0.08 0.05
00227w	Hen Gastell (Dan Y Lan Camp)	Described by RCAHMW in 1964 as an oval enclosure measuring 50 m long (E-W) by 30m wide, enclosing an area of 0.1 ha. The N side is formed by a natural edge where the ground falls away very steeply.	255430	195780	0.5 0.12
00233w	Cil Ifor Top (NW)	Cil Ifor Top is a strongly defended hill-fort occupying the summit of an isolated ridge running NW-SE, at 120 m OD. The ground falls away steeply on the NE, and NW from the edge of the salt marsh. To the SW the slope decreases. The enclosure follows the	250550	192400	6.71 2.65
00241w	Gron Gaer (NE)	GRON GAER stands at about 70 m above O.D about a kilometre S of Pen-Clawdd on a spur defended naturally on the W by a sharp fall into a ravine, and to a less extent on	255040	194760	0.6 0.24

		the N by a re-entrant valley.			
00246m	Cae Summerhouse Camp	Important concentric site located just on almost level summit above the mouth of Ogmore River (Afon Ogwr) behind Merthyr Mawr Warren. Moderate surrounding slopes, steeper on W. Excavations by J.L. Davies 1966-67 and 1973 showed a complex sequence of pre-Roman phases, starting with undefended site, with at least one timber roundhouse, followed by palisaded second phase, then banked and ditched settlement with further phases.	286390	177980	
00263s	Caer Dynnaf (W)	Damaged hillfort with triple ramparts situated on the top Llanblethian Hill, enclosing an area of c. 3.8 ha within the main rampart, and a further 1.1 ha between inner and outer banks, with an entrance to the west. Internal occupation evidence identified.	298350	174270	6.36 3.41
00275m	Chapel Hill Camp (SW)	Small hilltop camp defended by a single bank & ditch. Position of original entrances doubtful owing to wood & undergrowth.	288870	178060	0.77 0.38
00303w	Enclosure in Ilston Parish-Willoxton Cwm	Hillslope enclosure with three concentric defensive ditches sited in pasture on the southern edge of a slope above an escarpment. Partly cut into by modern quarrying and barely visible on the ground.	254880	189210	No OS, DTM or GE detail to extract polygon from.
00313w	Redley or Caswell Cliff Camp (NW)	A small enclosure on a steep-sided limestone promontory at Caswell, with artificial defences consisting of two widely spaced earthworks orientated north-south which cut across the neck of the ridge.	258800	187560	0.27 0.1
00317s	Mynydd-y-Fforest (SW)	Listed under Iron Age univallate enclosures in positions unsuited to	300740	178350	0.62* 0.13*

		defence. The earthwork stands at about 120 m above OD, on a southward-facing slope of about 1 in 6 about a kilometre NW Ystradowen. The position, which has a good view in all d			
00327s	Llanquian Wood (SW)	Hillfort with two widely spaced sets of defences. The outer enclosure forms an irregular circle, some 180.0 m diameter with entrances in the W and SW sides. The inner enclosure is roughly oval.	302140	174460	2.92 0.82
00336m	Cwm Bach (SE)	A grass covered enclosure with no visible remains of internal habitation.	289700	171730	0.48 0.3
00341m	Ty'n-y-Waun (SW)	A small spur, outlined by contours. The end rises in a knoll which is naturally defensible, & this has been fortified by a single rampart to form a D-shape.	294850	185270	0.9 0.35
00345w	Graig Fawr (SW)	Graig Fawr, about 4 km NE of Pontarddulais. The summit, 270 m above OD, is occupied by a fortified enclosure. It is D-shaped, measuring about 90 m from SW to NE by 65 m, the area being 0.5 ha.	261830	206850	1 0.48
00346s	Llantrithyd Camp, Llancarfan (NE)	A bivallate enclosure stands about half a km NW of the church. The area has been ploughed, and the remains are much worn down and obscured.	303860	173180	0.89 0.41
00358s	Y Gaer (N)	Bonvilston Gaer	306350	174730	1.48 0.19
00359s	Castell Moel (S)	Plough-damaged univallate hillfort of presumed Iron Age date located on a low hill 820 m south-west of Bonvilston. Inside is sited a former medieval moated manor house of c13th century date (PRN 2234s).	305400	173400	1.35 0.17

00377w	Earthwork near Fforest Newyddd	Traces of possible oval level terrain fort located on level ground above ravine of the Nant y Crimp to E, about 2km N of Llangyfelach. Measures c. 90m NE-SW by 65m, internal area 0.5ha. General moderate surrounding slopes apart from sharp fall to E into ravine. Wide and spread earthen bank c. 12 to 17m wide and 0.5-1m high. S side formerly ploughed-out in cultivated land. Ditch not defined, but probably existed. Gap at NE end of the enclosure, 7m wide, possible entrance. Now under planted woodland. Minimal investigations, undated.	263630	201550	
00382m	Coed-y-Mwstwr	Coedymwstwr was catalogued by RCAHMW (1976b, 20 no.614) among the large univallate hillforts, although there is no evidence other than morphological to confirm an Iron Age date. The site visit carried out as part of the Early Medieval Ecclesiastical Site.	294340	180990	5.04 3.31
00383m	Mynydd-y-Gaer Hillfort (S)	Apart from minor mutilation it is in good condition & consists of a pronounced bank with outer ditch forming an enclosure of generally sub-circular form.	297350	184950	1.62 0.99
00383s	Castle Ditches, Llancarfan (E)	Iron Age univallate hillfort. A single strong bank and ditch enclose an are of about 4.2 ha now mostly under plough. Decorated pottery of 2nd-4th century AD date.	305900	170020	6.04 3.81
00387g	Cae Camp (S)	Camp has been constructed from a natural prominence, the quarry in the centre showing solid sandstone beneath a 3 inch topsoil. The slopes have been scarped.	335900	193850	1.31 0.34
00397s	Llanfythin	Iron Age Hillfort comprises of two	305464	171813	0.94

	Camp, Llancarfan	earth and stone ramparts, with outer ditches. The site is under pasture, and has been reduced and spread by the plough.			0.22
00400s	Nash Point Camp (NE)	The enclosure is grass covered and contains no visible remains of internal habitations.	291480	168480	1.28 0.3
00451w	Llwynheiernin (SW)	Triangular shaped enclosure with evidence of archaeological excavation trenches. Presumed Iron Age.	267370	194720	0.51 0.12
00464w	Carn Nicholas (SW) Spring	At 150 m OD on N side of Kilvey Hill, an oval enclosure 45 m long from WNW to ESE by 37 m wide, area 1.0 ha. The single bank, surviving best on the W side, consists of earth and stone. The bank merges into the scarp on the S, to the E it is ploughed out.	267550	194340	0.32 0.27
00473g	The Larches Camp (W)	Earthwork occupies summit of heavily wooded hilltop & is in good condition. Interior is slightly above level of its defences. Consist of single bank & outer ditch.	343290	189960	0.52 0.16
00474g	Wilcrick Hill Camp (NE)	Hillfort surrounded by steep natural slope around which artificial defence has been constructed. This consists of a series of ramparts which have decayed.	341110	187800	6.25 1.55
00483m	Gwersyll Enclosure (E)	A roughly semi-circular rampart, standing on a broad ridge in enclosed, but uncultivated pasture. It is considered to be unfinished as is clearly not defensible. Standing in its interior are two possible earlier cairns.	302700	204030	0.4 0.2
00523s	Porthkerry Bulwarks (W)	Large multivallate hillfort, now covering 4.1 ha but some of has been lost to erosion. Excavations in the interior found three successive buildings behind the west rampart;	308200	166300	6.01 3.85

		earliest undated, second 1st-2nd century, latest 3rd-4th century.			
00551w	Glyn-Neath	The defences are partly natural, enclosing an area about 36 m in each direction, with earthworks visible on the N.E and S.E. On the E. angle, is a probable 4.5 m wide ditch. ON the S.E is a bank about 3 m wide, 0,3 m high and 33 m long.	288500	206850	No OS, DTM or GE detail to extract polygon from.
00564w	Carn Caca (W)	It is an oval E.I.A. fort which consist of two banks, max. 1 m high, 3 to 5 m wide, with a wide shallow ditch (4 m wide, 0.7 m deep) between them, the overall measuring 16 to 18 m wide. The whole enclosure has a length about 22 m from NW to SW, about 0.1 ha.	283850	200040	0.35* 0.05*
00582s	Danish Fort (N)	Sully Island	316850	166990	0.99 0.56
00592m	Lle’r Gaer (N)	Small Iron Age Camp defended by a single bank. Lies under corn which prevented close inspection. The camp is situated on the top of a slight rise in a field.	305010	187030	0.63 0.29
00597g	Lodge Wood (W & SE)	A large oblong hill fort situated on the top of a narrow ridge running WSW/ENE on the NW edge of Caerleon. It occupies a commanding position with extensive views all round. It is defended by a series of banks and ditches, with a narrow entrance and inner	332300	191300	6.15 1.63
00604s	Wenallt Camp (SW & NE)	A bank and ditch about 12m wide and 1.5m high overall encloses a fairly regular oval, 60 m N to S by 38 m. The entrance appears as a simple gap on the SE.	315210	182759	0.51 0.13
00619m	Caerau (E)	Hillfort, originally comprising of 2 close-set banks and ditches and a	306450	183200	5.82 3.38

		counterscarp bank, with no outer defences to the S, due to steepness of the ground. Defences now almost all destroyed except in NE sextant and a short length on W side.			
00627s	Castle Field Camp, Graig-Llwyn (E)	The inner defence consists of a bank and ditch measuring nearly 20 m wide and 1.5 m overall. Traces of an outer bank at E end.	320450	184030	0.96* 0.44*
00645g	Caerau, Llanhennock	A small, circular, uni-vallate hilltop camp constructed from a natural prominence, with a fairly defensive position and within easy reach of water. The defences themselves are weak, but traces point to the earthwork originally being bi-vallate.	332980	193440	1.34 0.48
00651w	Mynydd Y Gaer (Gaer Fawr) Lower Camp (S)	The NW of the camp is surrounded by 240 m of ruinous rampart. The northern outer banks have been destroyed by cultivation, but the other remains are well-preserved. In the centre is an oval enclosure, 55 m by 33 m, about 0.1 ha. There are two probable entrances.	276570	194250	3.43* 0.20**
00652w	Craig Ty Isaf (NW)	The fort is about 210 m above OD. The centre, a roughly oval enclosure, is formed by a rubble wall, 65 m by 40 m (0.2 ha). There is a 3 m gap entrance towards the tip of the spur and another gap at the east end. There are three banks and ditches to the east.	275650	193380	0.8 0.21
00678w	Pen Y Castell, Cwmavon (SE)	Pen y Castell, Cwmavon, is an oval enclosure occupying the crest of an isolated knoll, the entrance being on the E. It measures 65 m by 30 m (0.2 ha), with a bank. Outside the bank is a berm 6-7 m wide, followed by a second rampart. There is trace of stones	278850	191740	6.09 0.18

00679w	Buarth Y Gaer (W)	Buarth y Gaer is a simple oval contour fort, 135 m by 107 m (0.1 ha). The enclosure consists of a single bank with external ditch, best preserved on the E. and N.E. Entrance is 12 m wide, and located at the W end. The structure is partly destroyed on the S.	276550	193600	1.47 0.8
00709w	Cefn Yr Argoed (NE & SW)	At 300 m OD on ground falling to the SW, about 3 km NW of Maesteg. A sub-rectangular (possibly oval) enclosure 0.1 ha, bounded by a substantial bank with external U-shaped ditch, well marked on the NE and SE, but slighter on the NW and is absent on the SW.	283020	194050	0.1 0.08
00713m	Llwynda'-Ddu/ Llwynda-Ddu (SW)	Small hill-top camp with single rampart of moderate strength, oval plan, inturned entrance at W end.	310850	181000	0.94 0.48
00745g	Gaer Hill, Penterry (SW)	Please note that some of the sources contain information that, as yet, has not been included in this description field. This will be updated in due course. W bank of central enclosure ploughed out, S bank in process of being ploughed out in 1974.	351700	197960	4.69* 0.39*
00745w	Half Moon, Margam	Half Moon Camp is an oval enclosure about 150 m above O.D. It measures about 53 m long from NW to SE by 37 m wide and the area is about 0.2 ha. The rampart is best preserved on the N.E., where it is about 9 m wide/ 0.3 m high. It survives as a scarp on the S	279960	186730	0.36 0.12
00748g	Blackcliffe Wood Camp (SW)	A small sub-triangular promontory camp on a hill spur; univallate on South, scarped on West and East. The earthwork is in poor condition and is covered with trees and dense undergrowth.	352900	198990	0.37 0.24

00756w	Mynydd -y-Castell (W)	Iron Age Hillfort, single rampart, enclosed area 2.7 ha, roughly D shaped.	280610	186550	4.69 1.56
00758w	Caer Cwmphilip or Moel Ton Mawr NIA	Angular earthwork with an annexe on the S side and on the SW side. Very eroded.	282550	187020	4.3* 0.46*
00759w	Caer Blaen-Y-Cwm, Margam (S)	Caer Blaen-y-cwm stands at 300 m above OD. The enclosure is quadrangular, covering 0.1 ha and is defended by two banks (4 to 6 m wide, 0.7 m high), separated by a ditch (1.5m deep from the edge of the banks). The entrance is on the S and is 4.5 m wide.	283330	188070	0.68* 0.05*
00773g	Pierce Wood (SW)	The smaller and westerly of two camps on a promontory on the West bank of the river Wye. It consists of a roughly square area enclosed on the West, East and South sides by a bank and on the North side by the natural scarp above the river.	353250	195720	1.17 0.64
00791s	Banks and ditches in field system NIA	Slight banks and ditches which appear to continue in existing field system. 1762-3 Jenner family estate map shows present field system in existence by that date.	312900	170400	No OS, DTM or GE detail to extract polygon from.
00804w	Warren Hill (SW)	Hillfort with rock-cut ditches. The summit is encircled by the remains of a strong bank and ditch, now reduced to a scarp with a terrace below. There seems also to be traces of a counterscarp bank. Defences are well preserved round the S and E sides.	273650	194100	1.97 0.6
00831m	Castell Morlais	An univallate, almost rectangular enclosure situated on a NW-SE aligned limestone ridge, occupying c. 1.6 ha. The hillfort has since been partly obscured by a mediaeval	305000	209500	Uncertain due to the subsequent occupation of the

		castle.			adjacent area by a mediaeval castle.
00942g	Great House Camp (N & S)	This is a medium-sized multivallate hillfort of triple ditch and bank construction of 5.42 acres. It is situated at the north east end of a ridge overlooking the Olway Valley.	343224	203341	5.72 1.67
00943s	Pencoedtre NIA	Banks and ditches, interpreted as a hillfort, were identified in 1965. Further work by RCAHMW in 1976 showed the location reported lies on enclosed pasture with no trace of earthworks other than field-banks. Site rejected.	312100	170200	0.72 0.24
00972g	Gaer, Trellech (SW)	A sub rectangular enclosure defended by single bank. The entrance is located at the southwest corner, flanked on one side by heightened and thickened terminal of bank. There is a single hut circle on the platform sunk into hillslope on the north side.	349300	203770	0.88 0.32
01022g	Castell Prin (S)	The enclosure is situated on a wooded hilltop to the south of Wentwood and is oblong in shape with a flattish interior. It occupies the western end of the hill, with the ground sloping away to the north, south and west rather steeply.	340980	192390	0.61* 0.08*
01026g	Llanmelin Wood (SE)	Early Iron Age multivallate hillfort, with Roman and medieval reoccupation.	346100	192570	3.21 1.01
		Camp			0.56 0.15
01107m	Craig-y-Dinas (W)	Large hillfort, a scheduled ancient monument	291500	208100	6.08 2.01
01131g	Gaer Fawr	An overall summary is that the hillfort utilizes a spur whose steep	344140	198810	6.46 2.65

		sides form a natural defence on the north, west and east sides. The easiest approach is from the south where strong ramparts cut across the neck of the spur.			
01142g	Sudbrook Camp (N)	Iron Age camp situated on the shore of the Bristol Channel at the southern end of the village of Sudbrook, formerly comprising triple banks and ditches which have been damaged through erosion and development. Also occupied in the Roman period.	350550	187320	3.2 1.1
01193g	The Bulwarks, Chepstow (SW)	This small stronghold is formed on a corner of land above the River Wye, about 50 m OD and nearly the same height above the river which is here a tidal water, the land rises towards the northwest and to the south a steep, narrow gully separates the enclosure.	353790	192730	1.45 0.8
01263g	Kymin Hill NIA	The ramparts consist of two banks each of which are now spread over an area some 30 m wide respectively, with a 60 m wide berm between the two. There was no discernible inner height to the inner bank, but over the 30 m width the outer side of the inner bank.	352690	212550	No OS, DTM or GE detail to extract polygon from.
01452s	Kennel Grove NIA	A line of overgrown quarry pits suggests on some aerial photographs the presence of a ploughed-out hill fort.	303950	179000	No OS, DTM or GE detail to extract polygon from.
01497g	Ysgyryd Fawr (S)	A double enclosed area identified on the bleak ridge of Ysgyryd Fawr, from a private aerial photograph taken in 2000. Earthworks interpreted as a possible Iron Age hillfort or as a religious enclosure.	333110	218270	6.28 1.27

01607g	Pen Twyn (E)	This earthwork is situated in a commanding position at the south end of Hatterall Hill on a ridge with ground sloping away to the west and south, and with a natural scarp on the east giving panoramic views all round. The enclosure is grass and bracken	332110	223030	3.29 2.38
01672m	Craig Ruperra (SW & NE)	A previously unrecorded hillfort measures about 300 m internally, SW-NE about 36 m across. Within the hillfort at the highest point of the ridge is a motte.	322300	186700	2.68 0.97
01713g	Twyn Y Gaer, Cwmyoy (E)	Defended Iron Age settlement with two apparent size contractions identified from a private aerial photograph taken in 1999.	329400	221950	2.58 1.54
02103s	Westward Corner (S)	Emergency excavations were undertaken on this site in 1981 after service- trenches dug during housing development uncovered a rock-cut ditch containing IA pottery	309190	166890	No OS, DTM or GE detail to extract area from.
02166g	Llancayo (SE)	A large univallate hillfort situated on the northern end of a ridge, with ground sloping steeply away to the north and west. Oval in shape, the camp's main bank and ditch defences are wooded, as are the slope to the north and west. Those slopes to the so	337830	203820	4.71* 1.78
02171g	Coed y Bwnydd (NE)	The enclosure is situated on a hilltop with panoramic views; covered in light woodland and with denser woodland below it an all sides, except the northeast it is roughly circular in shape with a flat interior. The ground slopes away steeply on all but	336550	206850	3.36 1.25
08386w	Caer Crib-y-Bryn, Penclawdd	A large circular enclosure reported to the Trust by a member of the public in 2016. The earthwork lies	255166	194844	0.66 0.36

	(NE) NIA	about 100 m NE of the scheduled hillfort Gron Gaer (00241w).			
08941g	Mitchel-Troy Enclosure	Apparently concentric tri-vallate enclosure. Ditches only visible on northwest side. DWT 14/06/1999	349068	210676	
11309g	The Knoll, Penhow (SW) NIA	A defended enclosure roughly triangular or D-shaped with substantial banks following the contour of the hill. Under tree cover and unknown until identified on LIDAR in 2010.	342440	190470	0.98 0.38
	Y Bwlwarcau, Eastern Enclosure	Unscheduled rectangular hillslope enclosure located to E and below Y Bwlwarcau (Atlas No. 1546), but overlooking the confluence of the Nant y Gadlys and Lynfi River. Substantial inner bank and outer ditch, measuring 47m by 49m, enclosing c. 0.25ha. Survives in the corner of a field, but, despite its small size, the likeness to central structure of Y Bwlwarcau hillfort upslope, substantial ramparts and position controlling confluence make it a possible candidate for hillfort status. Little known, recorded during RCAHMW aerial reconnaissance 2010, on 1st Ed OS map (1885-1900). Minimal investigations, undated.	285162	18868	

Polygons and entrances obtained from 2 m composite Lidar data supplied by Lle (Copyright Natural Resources Wales).

*OS as TIFF files (Version June 2018- Downloaded 11th September 2018).

** Google Earth

***England & Wales OS Hills 1892-1908

NIA= Not in Atlas of Hillforts of Britain and Ireland

Appendix F: HER Promontory Forts (17 records)

PRN	Name	Summary	X	Y	Approx. area maximum extent and inner (ha.)
00110w	Worms Head (SE)	The faint remains of a promontory fort can be traced on the summit area of the Inner Head.	239350	187550	0.47 0.33
00138w	Horse Cliff (SE)	The remains of the fort are situated on a promontory protected on three sides by almost sheer cliffs. A single bank and ditch protects the only approach from the E.	243500	186040	0.12 0.08
00139w	Old Castle, Rhossili Cliffs (SW)	Located on a blunt promontory of Rhossili Cliffs, overlooking the Bay is a promontory fort. The site consists of a single semi-circular line of high bank with an external ditch enclosing an area of roughly 0.7 hectares.	240930	187980	1.01 0.61
00140w	Lewes Castle (NE)	Two rows of banks and ditches enclose an irregular rocky promontory sloping upwards to the SE and bounded by sheer cliffs. The outer line of defence consists of two banks separated by a ditch.	241440	187340	0.48 0.08
00141w	Thurba Head (NE)	A complex promontory fort occupying a steeply side promontory with irregular topography. Three lines of defence enclose an area c.150 m long and 80 m wide, defending the level approach from the NE.	242200	187050	0.51 0.26
00142w	The Knave (NE)	A fort located on the Knave promontory, lying off N.T. property. The site is defended by 2 lines of defences, running in almost concentric arcs, with sheer cliffs to the south and broken cliffs to the SW and SE.	243180	186370	0.52 0.13
00143w	Yellow Top	This site lies on a narrow promontory	243700	185960	0.06

	(NE)	varying from 10 to 65 m wide in places, defended on 3 sides by naturally steep slopes.			0.02
00280w	Crawley Rocks, Nicholaston Burrows (NW)	Situated on a limestone outcrop in Crawley Woods is a promontory enclosure. First recorded in 1949 it consists of two banks and ditches running roughly 35 m across the neck of the promontory to the north, enclosing an area of roughly 1 hectare.	251880	187960	0.31 0.12
00297w	Maiden Castle, Oxwich Point (SW)	An unscheduled promontory fort lying just outside NT property on sloping ground of Oxwich Point. The whole area is thickly covered with trees and undergrowth obscuring the remains, the exact boundaries of the fort are uncertain.	250900	185400	1.07 0.38
00309w	Bishopston Valley (N)	Promontory fort surrounded by the Bishopston valley. A National Trust Survey of 2002-03 recorded no visible internal features, the most obvious remains being the two defensive ditches and banks.	256930	187800	0.2 0.06
00312w	High Pennard (NE)	The fort at High Pennard is situated on a rocky promontory, defended on the south and west by steep cliffs, enclosed by a bank and ditch running in an arc for c.80 m, bisected by a 4 m high cliff running NE-SW.	256770	186630	0.21 0.14
00329m	Dunraven NIA	An Iron Age hillfort situated on a headland projecting west into the sea, partly destroyed by the building of a house within it.	288670	172790	5.65 3.3
00337m	Whitmore Stairs NIA	Remains of earthwork, which has extensively suffered from erosion, now consists of a rather weak bank with an external ditch at its SW & NW ends.	289880	171450	0.57 0.26
00447s	Castle Ditches, Llantwit Major	Roughly triangular in shape, Castle ditches, Llantwit, has natural defences on the S of the cliff and on the NW of a steep scarp. Coins of Carausius were	296020	167420	4.06 1.99

	NIA	found inside.			
00453s	Summerhouse Camp NIA	The site is naturally defended by a steep-sided re- entrant to the N, a sheer cliff face to the S and a fairly steep natural slopes to the E.	299450	166470	1.95 0.2
00467m	Flemings Down NIA	The tip of a natural spur at the NW end of Fleming's Down has been cut off by a substantial bank and ditch about 20 m across and 3 m high. The entrance was probably at the N end. The earthwork possibly dates from the Late Iron Age or early Medieval period	288950	176800	0.8 0.6
00772g	Piercefield Great Camp (SW)	The easterly of two camps, the earthwork is situated on a promontory on the West bank of the river Wye. It utilises the steep natural slopes on the North West, North East and South East for its defences, and three banks with medial ditches constructed on	353630	195960	4.11 3.22

Polygons and entrances obtained from 2 m composite Lidar data supplied by Lle (Copyright Natural Resources Wales).

NIA= Not in Atlas of Hillforts of Britain and Ireland

Appendix G: HER Domestic (66 records)

PRN	Name	X	Y	Period
00753s	Pentre Meyrick	296210	176020	Bronze Age
02530g	Prehistoric settlement Cold Harbour	343210	184200	Bronze Age
03480s	Lesser Garth Cave	312550	182100	Bronze Age
00164m	Mynydd Cefngyngon settlement	295730	203400	Iron Age
00188m	Roger's Lane, Laleston	286900	180600	Iron Age
00380m	Coed Y Gaer, Homestead Enclosure	293910	181390	Iron Age
00811m	Hut circle settlement, Cefn Car	302069	213512	Iron Age
00857s	Tyn Y Waun/ Newton	299892	176105	Iron Age
00868m	Corntown enclosure	292600	176500	Prehistoric
02420s	Rectilinear enclosures, Kenson south	305220	168470	Iron Age
06054m	Prehistoric settlement complex, Cefn Car	302245	213297	Prehistoric
06062m	Prehistoric settlement complex, Garn Ddu west	302090	212322	Prehistoric
06068m	Glais Brook settlement complex	303677	211569	Prehistoric
06163g	Coed-Y-Fon	337150	194710	Iron Age
06238m	Settlement near Nant Moel Resr	298420	206950	Prehistoric
09223g	Bwllfa Cottages Enclosure	338500	194310	Prehistoric
05096s	Series of wooden posts	322900	177900	Bronze Age
00022m	Padell Y Bwlch	294477	203549	Iron Age
00078m	Hen Dre'r Gelli	297660	194020	Iron Age
00144w	Enclosure on Rhossili Down	242300	189800	Iron Age
00220m	Hut, Merthyr Mawr	284960	177240	Prehistoric
00544w	Onllwyn Hut on Hirfnydd	281460	206410	Unknown
00732m	Pant Waungorrwg enclousre 1	310040	190165	Iron Age
00772m	Hut circle, Cwm Cadlan	297510	210940	Iron Age
00793m	Possible hut circle, Cefn Car	302348	213295	Prehistoric
00820m	Ollwyn hut	300660	210290	Bronze Age
01104m	Hut circle	302970	208040	Bronze Age
02055m	Hut circle, Cwm Cadlan	297634	210930	Prehistoric
02058m	Possible Hut circle, Cwm Cadlan	298730	211100	Prehistoric

02136m	Wernlas hut circle, Hirwaun	296440	209580	Bronze Age
02302g	Trefil Ddu hut circle	311497	212582	Unknown
02381s	Rumney Great Wharf	324000	177800	Prehistoric
02529g	Chapel Tump	344600	185000	Iron Age
06060m	Hut circle, Cwm Cadlan	297510	211002	Prehistoric
06061m	Possible hut circle, Cwm Cadlan	297598	210987	Prehistoric
06070m	Glais Brook platform 1	303677	211569	Prehistoric
06071m	Glais Brook platform 2	303679	211558	Prehistoric
06073m	Glais Brook platform 3	303690	211576	Prehistoric
06074m	Glais Brook platform 4	303677	211569	Prehistoric
06654w	Circular hut with internal partitions	242270	189082	Prehistoric
08099w	Hut circle, Rhossili Down	242270	190870	Prehistoric
08100w	Hut circle, Rhossili Down	242310	190780	Prehistoric
09034g	Afon Sirhowy hut circle	311900	211900	Bronze Age
00013s	Dinas Powys earthworks and settlement	314820	172250	Iron Age
00163m	Hut settlement, Tarren Y Bwlch	295089	203530	Iron Age
00237m	Burrows Well settlement	285580	177200	Iron Age
00240m	The open settlement	286090	176870	Iron Age
00447m	Dynevor Arms (Baverstock Hotel) settlement and Cairnfield	300250	207680	Bronze Age
00530s	Moulton Roman site, Lancarfan	307410	169630	Iron Age
00578s	Biglis	314200	169400	Iron Age
01997s	Atlantic Trading Estate	313200	167250	Bronze Age
02069g	Trostrey hut circles	335900	204600	Unknown
02169g	Woodland Cottages, Caldicot	347298	189302	Iron Age
03979g	Chapel Tump 2	344700	185140	Bronze Age
04024s	Llanmaes settlement and midden site.	298200	169600	Bronze Age/Iron Age
04324g	Goldcliff	336950	182030	Prehistoric
04441g	Thornwell Bronze Age/Romano-British enclosure	354000	191980	Bronze Age/Iron Age
04891m	Hut circle settlement, Merthyr Common	308171	204600	Prehistoric
06051m	Possible settlement Pant Y Gadair	298500	212600	Prehistoric
06066m	Enclosure Group, Cefn Car	302350	213270	Prehistoric
06101m	Hen Dre'r Gelli	297974	194255	Iron Age
08640g	Twyn Ceiliog settlement and	309920	212670	Bronze Age

	cairnfield, Cefn Pyllau Duon			
08651g	Green Moor Arch Iron Age site, Redwick	340000	186700	Iron Age
02942s	Burton House East	304230	167850	Prehistoric
06055m	Possible field system and settlement, Cwm Cadlan	297482	210993	Prehistoric

Appendix H: HER Agriculture and subsistence (72 records)

PRN	Name	X	Y	Period	Type
00004m	Coed Garn Y Gist Cairnfield	292330	207030	Bronze Age	Cairnfield
03984g	Llwyncelyn Cairn Group	293250	206630	Bronze Age	Cairnfield
00006m	Cairnfield, Twyn Bryn-Hir	293770	206620	Bronze Age	Cairnfield
00039m	GellieI-Goch Cairnfield	293990	197440	Bronze Age	Cairnfield
00054m	Maendy Camp Cairn Group	295730	195510	Bronze Age	Cairnfield
00077m	Mynydd-Y-Gelli Alleged cairns and huts	297640	194050	Bronze Age	Cairnfield
00083w	Cefn Bryn Cairnfield 2	248607	190760	Bronze Age	Cairnfield
00098m	Mynydd Caeran Cairnfield	289000	194000	Bronze Age	Cairnfield
00117m	Y Bwlwarcau Cairnfield	284170	188680	Bronze Age	Cairnfield
00340w	Graig Fawr Cairn Group	262900	207200	Bronze Age	Cairnfield
00341w	Banc Llwyn Mawr Cairn Group	262970	207200	Bronze Age	Cairnfield
00360m	Mynydd Maesteg Cairnfield	297720	190170	Bronze Age	Cairnfield
00367w	Cefn Drum Cairnfield	261310	204390	Bronze Age	Cairnfield
00447m	Dynevor Arms (Baverstock Hotel) settlement and cairnfield	300250	207680	Bronze Age	Cairnfield
00495w	Mynydd Y Garth	270950	207660	Bronze Age	Cairnfield
00504m	W Side of Cefn Gelli-Gaer, Cairnfield (Coly-Uchaf)	309379	203126	Bronze Age	Cairnfield
00514m	Cefn Merthyr (Mynydd Y Capel) Cairn Group	308300	200000	Bronze Age	Cairnfield
00538m	Penrhiw Cradoc Cairn Group	302830	198380	Bronze Age	Cairnfield
00562m	Tir-Lan Cairnfield	309570	199400	Bronze Age	Cairnfield
00577m	Carn Y Wiwer Cairnfield	302660	194180	Bronze Age	Cairnfield
00643m	Cil-Haul Cairnfield	311780	202500	Bronze Age	Cairnfield
00650w	Gaer Fawr Cairn Group	276570	194250	Bronze Age	Cairnfield
00688w	Gwenffrwd Cairn Group	280510	199480	Bronze Age	Cairnfield
00773m	Cwm Cadlan Cairnfield	297500	210940	Bronze Age	Cairnfield
00821m	Glais Brook Cairnfield	303660	211440	Bronze Age	Cairnfield
00854m	Merthyr Mawr Warren	285400	177210	Prehistoric	Cairnfield

00995m	Mynydd Maendy	294950	195050	Bronze Age	Cairnfield
01099m	Cefn Cilsanws Cairnfield	302470	209900	Bronze Age	Cairnfield
01183m	Penmoellallt West Cairnfield (Formerly SAM GM164)	301050	209650	Bronze Age	Cairnfield
01184m	Penmoellallt East Cairnfield (Formerly SAM GM164)	301310	209610	Bronze Age	Cairnfield
01217m	Rhos Gwawr Cairn Cemetery (SE Group)	299600	200400	Bronze Age	Cairnfield
01356m	Vaynor Cairns (Garn Ddu Cairnfield)	302620	211980	Bronze Age	Cairnfield
01357m	Garn Pontsticill Cairnfield	305300	211700	Bronze Age	Cairnfield
01708m	Maerdy Reservoir	296080	200490	Bronze Age	Cairnfield
02063m	Cefn Sychpant NW Cairnfield	297500	210280	Prehistoric	Cairnfield
02234w	Cefn Bryn, Cairnfield	250882	189223	Bronze Age	Cairnfield
02235w	Cefn Bryn, Cairnfield	251620	189300	Bronze Age	Cairnfield
02238m	Hendre Gelli Cairnfield (= PRNS 73M, 74M, 77M)	297500	193900	Prehistoric	Cairnfield
02596w	Graig Fawr Cairnfield	262300	207500	Prehistoric	Cairnfield
03535m	Cefn Sychbant Cairnfield	298681	210096	Bronze Age	Cairnfield
03539m	Nant Cwm Moel Cairnfield	303950	211320	Bronze Age	Cairnfield
05106m	Mynydd-Y-Glog, Cairnfield	296780	209310	Prehistoric	Cairnfield
05160m	Pant Sychpant Cairnfield	298500	209530	Prehistoric	Cairnfield
00482w	Mynydd Y Garth 1	270841	207506	Bronze Age	Clearance cairn
03433w	1998 Uplands Survey	274194	210038	Bronze Age	Clearance cairn
03533m	Site name not known	296700	209550	Bronze Age	Clearance cairn
03536m	Site name not known	297340	210100	Bronze Age	Clearance cairn
03537m	Site name not known	297100	209800	Bronze Age	Clearance cairn
05087m	Cwm Nant-Hir, Field Clearance Cairns	298912	207939	Prehistoric	Clearance cairn
05115m	Cefn Car Cairn V	301840	213100	Prehistoric	Clearance cairn
06892g	Cairn at Llanhilleth	322172	202475	Bronze Age	Clearance cairn
06894g	Clearance Cairn at Llanhilleth	322235	202495	Bronze Age	Clearance cairn
08641g	Twyn Ceiliog Cairn I (AKA Cefn Pyllau Duon)	309920	212670	Bronze Age	Clearance cairn
08642g	Twyn Ceiliog Cairn II (AKA	309890	212700	Bronze Age	Clearance cairn

	Cefn Pyllau Duon)				
08643g	Twyn Ceiliog Cairn IV (AKA Cefn Pyllau Duon)	309880	212710	Bronze Age	Clearance cairn
08640g	Twyn Ceiliog Settlement and Cairnfield, Cefn Pyllau Duon	309920	212670	Bronze Age	Clearance cairns
00147w	Field Boundary Wall, Rhossili Down	242010	189030	Prehistoric	Field boundary
04886m	Field Boundary 1, Merthyr Common	307669	209761	Prehistoric	Field boundary
04904m	Merthyr Common Field Boundary 2	307435	210565	Prehistoric	Field boundary
04947m	Field Boundary 2, Merthyr Common	307440	210580	Prehistoric	Field boundary
06056m	Possible Field Boundary, Cwm Cadlan	297460	211300	Prehistoric	Field boundary
06057m	Field Boundary, Cwm Cadlan	297482	210993	Prehistoric	Field boundary
06058m	Field Boundary, Cwm Cadlan	297878	210992	Prehistoric	Field boundary
06689w	Field Boundary, White Moor	242479	190503	Prehistoric	Field boundary
02925s	Cwm-Cidy West	308800	167600	Prehistoric	Field system
02942s	Burton House East	304230	167850	Prehistoric	Field system
02944s	Top Tredogan	307230	167670	Prehistoric	Field system
03344m	Possible Field System, Tredegar Fach	305600	211800	Prehistoric	Field system
03593.0s	Llanfrynach East	298040	175400	Prehistoric	Field system
09206g	Field System on Waun Pwll Mawr	327687	208311	Prehistoric	Field system
11483g	Field System, Rockfield Farm	343690	187679	Prehistoric	Field system
11484g	Possible Banjo Enclosure, Rockfield FARM	343707	187710	Prehistoric	Banjo enclosure

Appendix I: Fords (34 records)

PRN	Name	X	Y	Period
0070g	Ford, Gaer	329470	185940	Mediaeval Ford
00183g	Ford, Stow Hill	331240	188420	Prehistoric Ford
00204w	Old Ford (Site of), on River Loughor, Loughor	256253	198150	Post Mediaeval Ford
00255g	Ford, Llanwern	337010	188330	Early Mediaeval Ford
00286m	Ford, St. Brides Major	287550	176470	Mediaeval Ford
00380g	Ford, New Bridge, Llanhennock	338510	194800	Early Mediaeval Ford
00631w	Ford, Neath	275000	197800	Mediaeval Ford
00726g	Ford, Tintern	353890	200820	Unknown Ford
00743g	Ford, Tintern	353100	200740	Early Mediaeval Battlefield
00939g	Rhyd-Y-Maen	343500	205200	Unknown Ford
01009m	Ford, Merthyr Mawr Warren	287800	176700	Unknown Ford
01016.18w	Ford, River Tawe (Part of Roman Road RR60)	266110	194480	Roman Ford
01373w	Glanrhyd Ford	259080	197760	Unknown Ford
01779w	Ford, Llanelli	256010	198110	Unknown Ford
01843g	Ford, Llanover	35850	208980	Mediaeval Ford
01846g	Rhyd-y-gravel Ford	335850	209450	Mediaeval Ford
02001g	Ford, Llanbadoc	337640	200110	Unknown Ford
03706m	Fords, Ogmore Valley	294981	189623	Post Mediaeval Ford
04024w	Cynon Ford	281854	195076	Mediaeval Ford
04118m	Ford, Ogmore Valley	294959	188090	Post Mediaeval Ford
05229.1g	Ford on Sor Brook (possible Roman Road RR Ggat	332700	196900	Modern Ford/ Roman Ford

	003)			
05640s	Ford, Lower Booth, Aberthaw	302928	166424	Post Mediaeval Ford
06671m	Ford, Llanharan	297440	182674	Unknown Ford
07024m	Ford, Maesteg	287660	190696	Post Mediaeval Ford
07040m	Sluice Ford / Felingrow, Laleston	288548	181661	Post Mediaeval Ford
08088m	Pen-y-bryn Road Ford, near Hafodheulog	284382	184545	Post Mediaeval Ford
08154m	Ford and Footbridge, Kenfig Road	284121	183568	Post Mediaeval
08376m	Ford, Ewenny, Bridgend	292410	178270	Post Mediaeval Ford
08397m	Ford, Ogmore Castle	288125	176977	Post Mediaeval Ford
08843w	Ford on Afon Lliw, South of Loughor	256228	197746	Multiperiod Ford/ Post Mediaeval Ford
09712g	Ford, Chain Bridge	334706	205679	Multiperiod Ford
10318g	Ford, Llangwm	341360	200378	Post Mediaeval Ford
15393g	Ford, Pont-newydd-fawr	325870	188845	Unknown Ford
15406g	Ford, Rhyd-fraith	321487	191522	Unknown Ford