Persistent traditions: a long-term perspective on communities in the process of Neolithisation in the Lower Rhine Area (5500-2500 cal BC)

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Chapter 4

Lower Rhine Area sites: a qualitative review

4.1 Introduction

This chapter provides a reflective overview of the qualitative aspects of sites and their datasets in the study area. The aim is to present the main formative factors and methodological approaches and demonstrate how sites in different regional settings vary according to the sources of information available. In this respect it particularly focuses on aspects of taphonomy and site formation and deals with the contrast between upland and wetland sites. It therefore also represents an outline of the quality and limitations of the available dataset, presented in Appendix I, for the period under investigation. The aim is to develop a framework of site formative inference for the LRA, roughly between 6000-2500 cal BC and as such an estimate for evaluating the character, nature and distribution of the data available. Assessing the strengths and weaknesses of the sites we use in our research into the transition to agriculture in this region might lead to a more accurate appraisalof the quality of our data as well as provide useful incentives for future research. This chapter has been divided into three main parts. The first provides a regional background to aspects of site and assemblage formation. The second part deals with a number of formative and methodological issues and traditions pertaining to how sites develop and how this influences research. The final part presents an archaeological site typology of a number of characteristic sites and deals with the issues of wetland representativeness.

4.2 A regional distinction

An important factor in the nature and impact of postdepositional processes on the archaeological record is the regional geomorphological and pedological situation, often in combination with the specific circumstances existing at the location of the site. Groenewoudt (1994, 50-51) distinguished thirteen different 'archaeoregions' for the Netherlands, that demonstrate a specific relation between the archaeology and the landscape both in terms of the character of the material record as well as in formative respect. For the LRA a similar, more general subdivision can be made, into five taphonomic regions (see fig. 4.1). These are the mountainous zone, loess, sandy uplands, wetlands and river valley floors.

Uniting or 'lumping' the many different local situations into five overall categories is of course an oversimplified rendering of the diversity of taphonomic and site-formative factors. For the LRA, however, it demonstrates the general framework into which most sites can be fitted and addresses the main actors

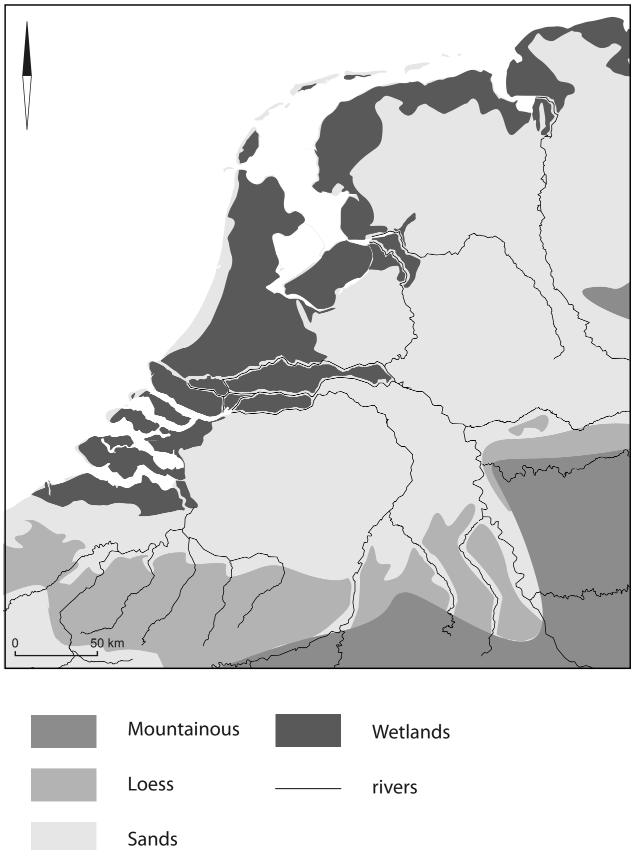


Fig. 4.1 General subdivision of the LRA study area into formative landscapes.

working at the different sites. A short characterization of the five different regions is given below (see also Berendsen 2005; De Mulder *et al.* 2003; Zagwijn 1986; 1989).

4.2.1 Mountainous zone

Location:

In the LRA only a limited part can be defined as a (low) mountainous area. This not only forms a geological separation but also archaeologically accentuates the LRA as a culturally integrated area for studying the transition to agriculture, as the development of the process of Neolithisation further south and southeast was of a different character. The mountainous areas in the LRA are formed by the lower reaches and foothills of both the Ardennes and the Eifel in the south and southeast. These include the Belgian regions of the Condroz and the Famenne consisting of a substratum of loam and rock as well as the rocky cliffs in the southern valley of the Meuse around Liège. The German *Mittelgebirge* (100-600 m) forms another mountainous zone located near the eastern limits of the Basin (see also Louwe Kooijmans 1998[a], fig. 1).

Processes:

Mountainous areas are subject to distinct formative and taphonomic processes. Intensive and high-energy erosion and weathering create limited areas where archaeological remains and features are embedded and sealed. Well-known examples are caves, rock shelters and small patches of mineral soil. The rocky substrate often does not provide ideal conditions for the preservation of organic remains. Furthermore the relative inaccessibility of mountainous areas may hamper the discovery of sites, while the specific environment may have limited the number of tasks executed there in prehistory.

4.2.2 Loess region

Location:

The loess area is situated in the southern and southeastern part of the LRA, wedged in between the mountainous zone and the Pleistocene sandy uplands. The area is often depicted as a continuous belt stretching from east to west (see for example Bogucki 2000, fig. 8.1), whereas in fact it represents an archipelago of loess patches or islands (actually upland basins) (see for example Bogaard 2004, fig. 1.1). These can subsequently be broken down into locally specific varieties such as the limestone area in Southern Limburg or the sandy-loamy soils of the Belgian Hageland. Despite their internal variation these fertile soils were a popular settlement location for the initial LBK farmers and subsequent Neolithic groups, thus forming the earliest region in the study area where agriculture was practised. Remarkable is the apparent absence of Late Mesolithic sites. This is often related to the development of the lush homogeneous Atlantic forest vegetation, which was probably unattractive for many species of wildlife, resulting in low overall quantities of and variety in biomass (but see Vanmontfort 2008[a]). On the other hand it cannot be ruled out that their invisibility is in part due to site formation processes.

Processes:

Several processes characterize the loess region. On the positive side, features of past settlements have often been preserved within developed soils such as brown podzolic soils (*Parabraunerden*), especially in level areas (*e.g.* Bakels 1978, 19-20). On the other hand soil processes often led to a certain degree of dissipation of features. Moreover, the (often undulating) relief in combination with surface runoff in many areas has led to considerable and ongoing erosion and colluviation. This has had a significant detrimental effect on the preservation of sites (See for example Modderman 1976 as well as Berendsen 2005) and may lead to a considerable distortion in the perceived distribution of sites, since especially those located on top and at the foot of slopes would have been affected. Furthermore, large stretches of the extensive loess cover within the LRA are no longer calcareous resulting in virtually no preservation of uncalcined faunal remains (*e.g.* Bakels 1978, 72). Although a 'Neolithic' subsistence base is assumed for most sites, this is partly based on external evidence and presumed analogies.

4.2.3 Sandy uplands

Location:

Located roughly north and west of the loess and mountainous zone and bordering on the eastern margin of the wetlands, the sandy uplands form the most substantial geological region within the LRA. Instead of one homogeneous zone this area actually harbours several different landscapes. In the northern and eastern limits of the study area, the subsoil of the sandy uplands is formed by glacial deposits of moraine on top of which coversand was deposited. Some relief in the form of dunes or ridges is present. Furthermore, substantial areas have been covered by oligotrophous peat, such as the Bourtanger swamp. In the Netherlands the moraine area is bordered by the palaeo-channels of the Vecht and the Hunze (Berendsen 2005, 74-75). Further south the sandy uplands are characterised by extensive coversand areas, low relief in the form of dunes and ridges as well as more conspicuous ice-pushed ridges, for example near the Veluwe. Several brooks regulate the discharge (*ibid.*; Groenewoudt 1994, 50, note 10). Yet another type of landscape can be found still further south and comprises the sandy uplands of Dutch Limburg and Brabant as well as the Belgian Campine area. The subsoil in large parts of this area is formed by ancient fluvial and marine deposits (Berendsen 2005; Bubel 2002/2003), on top of which Pleistocene coversand has been deposited. The relief consists of elaborate dunesand belts or ridges which to a large extent determine the direction of the drainage pattern. Apart from river valleys such as the Meuse, the Demer or the Scheldt and their tributaries, fens formed an important and attractive wet element in the landscape (see for instance Weelde-Paardsdrank; Opglabbeek-Ruiterskuil or Meeuwen in den Damp I in Appendix I). The Peel bog on the border of Dutch Limburg and Brabant forms an extensive oligotrophic peat area.

Processes:

In contrast to the diversity of the sandy uplands the formative processes affecting archaeological sites are rather similar across the area. An important feature is the relative stability of the surface preventing archaeological remains from becoming embedded (and as it were stabilized). This leads both to palimpsests of static and mobile archaeological remains as well as to exposure to various postdepositional processes such as bioturbation (see Bubel 2002/2003). Furthermore features have often (partially) disappeared due to a combination of limited depth and soil formation (*e.g.* Groenewoudt 1994, 113; Rensink *et al.* 2006). Unfortunately, the initial potential of this elaborate area has turned out to be very limited. It should furthermore be mentioned that certain parts of the coastal barriers and low dunes also classify as sandy uplands, at least with respect to formation processes.

4.2.4 Wetlands

Location:

The main body of wetlands is located in the central and western part of the Netherlands and might be defined as the Dutch delta. It consists of a variety of dynamic landscapes which, over time, have been subject to intensive alterations caused by changes in sea-level and related changes in groundwater level. In general several zones can be defined related to the transition from salt to fresh water and influenced by tidal and riverine regimes (see De Mulder *et al.* 2003; Louwe Kooijmans 1985; 1993[a]; Vos/Kiden 2005; Zagwijn 1986; 1989; Zeiler 1997).

- In the east the river clay area of the Meuse and the Rhine forms a dynamic environment of deposition and erosion. Within this environment river dunes and later on levees form dry elements.

- West of this, extensive wetlands with energetic riverine elements as well as lacustrine or swamp areas with stagnant or almost stagnant water and further characterised by development of eutrophic peat are located. Dry elements are formed by river dunes that have become embedded in Holocene deposits, the so-called 'donken'.
- To the west of these an area of saltmarshes can be found dissected by estuarine creek systems which formed important east-west corridors between the hinterland and the coast
- Finally, separated by an area of tidal flats, several coastal barriers with low dunes and interspersed with wide tidal inlets form the westernmost element. The sandy coastal barriers formed ideal locations for settlement from the second half of the fourth millennium BC onwards.

Several other wetland areas might also be defined:

- An important region is the IJsselmeer basin which was connected to the coast by extensive estuaries. A landscape of tidal flats (initially), creeks and backswamps developed (Ente 1976; Gehasse 1995; Hacquebord 1976; De Roever 2004; Zagwijn 1986; 1989) in which river dunes, levees and Pleistocene boulder clay outcrops formed dry, inhabitable elements. The tidal flats soon disappeared, especially when the area became connected to the coast (Louwe Kooijmans pers. comm. 2012).
- An area that has only recently been adequately archaeologically investigated is the Scheldt Basin. Here the former valley of the Scheldt as well as the adjacent sandy lowland have been covered by peat and (peri)marine clayey deposits. Dunes and elaborate coversand ridges form local dry elements (see Crombé 2005[b]).
- Finally isolated patches of wetlands can be included in this region. A good example is the creek-dissected marshland on the banks of lake Dümmer in Niedersachsen (Germany) (Deichmüller 1965; Stapel 1991).

Processes:

Many formative processes characterize wetland environments. Of major importance are the marine transgression and landward coastal formation. This process only came to a halt at the start of the Subboreal (± 4050 cal BC; Vos/Kiden 2005). As a result, most of the coastal occupation of the Mesolithic up to the Swifterbant period will have been lost (see also Raemaekers 2003). The absence of these data makes for a serious coastal hiatus in the reconstruction of settlement systems etc. Other negative processes are more localized and mainly relate to events of erosion destroying (parts of) sites as well as (temporary) drops in groundwater level leading to weathering and disintegration of organic finds. Yet another aspect is the fact that sites in specific areas such as the freshwater peat area are often buried beneath many meters of sediment and therefore often 'beyond the reach' of archaeological investigations. Of course on the other hand, because of their waterlogged and sealed conditions wetlands form ideal preservation contexts. Wetland sites are thus important, not only with respect to the preservation of organic remains and data on subsistence, but also because of the preservation of spatial information pertaining to a limited chronological timespan (see Louwe Kooijmans 1997; 1999).

4.2.5 River valleys

Location:

Although they might be classified together with wetlands, river valleys form a category of their own (*e.g.* Brown 1997). From a geographical perspective they differ from the extensive wetland areas because they consist of one or multiple channels located within an, often limited, valley. Conditions may also be more dynamic compared to many other wetland areas. From an archaeological perspective rivers, like wetlands, formed special habitats with distinct species of plant- and wildlife, raw materials etc. Furthermore they might have acted as important conduits for transport and communication in the past. Rivers and their tributaries can be found throughout the entire LRA and have continuously formed an attractive and sought after element in any type of environment. The most important rivers in the LRA are the Rhine, the Meuse, the IJssel, the Vecht and the Scheldt. Furthermore there are smaller streams such as the Hunze, the Dommel, the Hunte, the Geul and the Demer. Apart from terraces and valley margins the drier elements within river valleys are formed by covered palaeoridges, river dunes, crevasse splays and levees.

Processes:

River valleys are highly dynamic environments that are the subject of their own subdiscipline of archaeology (Brown 1997, 219-253 and 279-303; 2003). Their dynamic qualities make for a changing environment that hinges upon erosion and destruction of sites by channel activity and preservation of sites by deposition of sediment. In this respect river valleys are ambiguous entities since it is often unknown what part of the settlement system has been destroyed, or might still be preserved underneath thick layers of sediment (see also Groenewoudt 1994, 147; Schiffer 1987, 249-255). This has often led to a certain level of neglect for river valleys and smaller stream valleys in the archaeological field (see also Rensink 2004). Nevertheless, the locations that have been preserved often form important interpretative counterparts to the less informative upland parts of the settlement system. Furthermore organic remains and spatiotemporal patterning are sometimes preserved there (see for instance Liège-Place St.-Lambert, Jardinga, or Bronneger in Appendix I).

4.3 Uplands and wetlands: contrasting contexts

All the sites in the above-mentioned regions are to some extent affected by the same postdepositional processes. Artefacts weather and deteriorate by chemical, physical or biological agents. Sites and internal patterning are affected by bioturbation and related pedological processes. Local slope and gradient lead to processes such as colluviation. On a regional level, events such as shifts in groundwater level and coastal regression and transgression phases have a large impact (see Bubel 2002/2003; Schiffer 1987).

The general subdivision in physiographic regions above serves to show that most of the processes described in the foregoing are unevenly distributed. We are therefore dealing with environments which each harbour a characteristic set of taphonomic agents which, in combination with local conditions, are responsible for different levels of archaeological information. This has meant that the composition of the archaeological record in these environments is largely mutually incomparable, leading to certain problems when trying to correlate for differences, or similarities, in the use of sites, or for behaviour in these specific environments.

To further approach the specifics of this problem a basic subdivision can be made between upland sites and wetland sites. This distinction between wetland and upland is mainly based on regional landscape and environmental aspects. The terminology is of limited intrinsic value since both wetlands and uplands of course harbour a wide diversity of landscapes. The uplands category furthermore has different connotations in other areas where it stands for highland or mountainous regions. Another term would be drylands, but that also brings with it certain arid connotations. The term uplands will therefore be used here as a category for the non-wetland regions of predominantly Pleistocene origin in the LRA. This is a further simplification of the existing situation which is generally valid and functional with respect to taphonomic and site formative processes. To what extent it may also apply to a past perception will be discussed later on (see Chapters 6-9; see also Louwe Kooijmans 1997, 15, 19; Raemaekers 1999, 123). This abstract upland-wetland representation of the situation is generally applicable to many of the sites studied here and leads to a division with an overall positive or negative connotation (see table 4.1).

Upland sites	**Wetland sites**
ARCHAEOLOGICAL ASPECTS	
many	few
relatively easy to locate/excavate	hard to locate/excavate
regional perspective	limited site perspective
CHRONOLOGICAL CONTROL	
no clear temporal resolution	temporal resolution
continuous palimpsest	temporally limited palimpsest
low quantity/quality ^{14}C dates	high quantity/quality ^{14}C dates
SPATIOTEMPORAL INFORMATION	
continuous exposure to bioturbation	limited exposure to bioturbation
blurred intrasite spatial patterning	preserved intrasite spatial patterning
SUBSISTENCE AND SEASONALITY	
no preservation of uncharred organic remains	preservation of organic remains
no detailed information on subsistence	detailed information on subsistence
no information on seasonality	information on seasonality
LANDSCAPE AND ENVIRONMENT	
rel. unaltered regional palaeogeographical situation	changed regional palaeogeographical situation
few sources for ecological reconstruction	many sources for ecological reconstruction

Table 4.1 Juxtaposition of upland versus wetland qualities for a number of archaeological and systemic contexts. Note that positive upland qualities relate to the site in regional context. Positive wetland qualities are informative as to the site and site function itself.

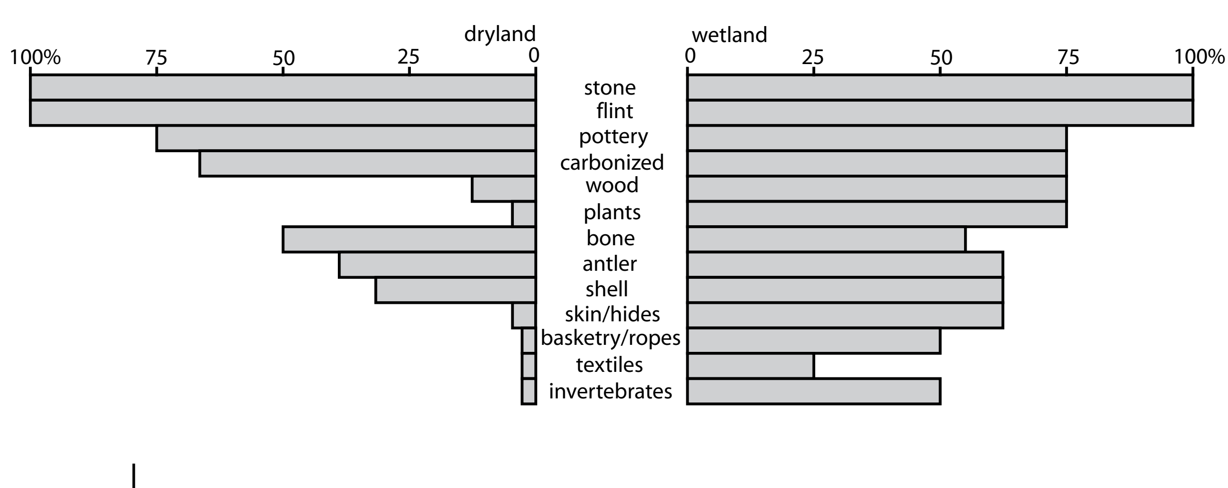
In the following, the contrast between the upland and wetland situation and its consequences for the archaeological record of the LRA in the Mesolithic and Neolithic will be further elaborated upon. The distinction between uplands and wetlands carries with it many different implicit repercussions for both the interpretation of sites and the degree to which they may be compared. A number of these aspects will now be discussed in more detail.

4.3.1 Preservation of artefacts

One of the most emblematic aspects when comparing wetland and upland archaeology is the qualitative and quantitative difference in preservation of artefacts (*e.g.* Coles/Coles 1989). The anaerobic waterlogged conditions of wetlands in combination with covering layers of sediment halt further deterioration of the archaeological record by physical agents as well as chemical and biological decomposition of organic remains (see also Schiffer 1987, 143-151).[1] If we compare the potential preservation of organic and anorganic remains in wetland and dryland situations for the period studied here, there is a clear contrast (see fig. 4.2).

The graph above was derived from survival rates of different materials plotted by Renfrew and Bahn (1996, 64). Since they use a global perspective their estimates of survival rates are rather positive compared to the correlation as depicted above for the LRA. An overview of the qualitative presence and absence estimation of the overall distribution of organic and anorganic remains at sites listed in the catalogue and the database demonstrates some important differences. For upland sites very little or no information at all has been retrieved for the categories of invertebrates, textiles, basketry/ropes, skin/hides, shell, plants and wood. The estimates for upland preservation of uncalcined antler and bone seem much too positive as do those for the preservation of carbonized remains. The amount of pottery that is preserved is also often limited at upland sites due to postdepositional processes. For the LRA wetland sites, organic evidence of textiles, basketry/ropes, skin/hides etc. is significantly less than the estimate in fig. 4.2. Furthermore, the degree to which invertebrates, bone, antler, wood and plants have been preserved is strongly dependent on the local preservation context within the excavation. In general it can be argued that since the survival rate of individual categories is dependent both on the intrinsic qualities of the objects (*e.g.* well-fired pottery) as well as specific local conditions (*e.g.* fast covering, deposition in a pit etc.), the distribution presented above can only be a rough estimate of a survival rate and

Fig. 4.2 Estimates of maximum potential preservation of organic and anorganic remains (adapted from Renfrew and Bahn 1996, 64).



mainly serves to contrast wetland and upland information. Several categories of mobilia are further discussed below.

Lithics

Stone and flint objects usually stand an equal chance of survival, both at wetland and dryland sites. Nevertheless, wetland conditions might be deemed slightly better since the prolonged exposure of these materials in the uplands to freeze-thaw cycles (thermal shock), anthropogenic or natural fires, trampling and more intensive soil movement effects (chipping etc.) leads to increased deterioration (*e.g.* Keeley 1980; Schiffer 1987, 151-158). With respect to use-wear analysis dryland lithic assemblages are less informative overall. First of all prolonged surface exposure at upland sites leads to more intensive patination, especially when compared to the discolouration observed on finds at wetland sites (*e.g.* Van Gijn *et al.* 2006, 133), which appears less destructive. Secondly mechanic alterations such as trampling and other postdepositional processes, leading to edge damage, chipping and striations, further affect the suitability for use-wear analysis. Thirdly, the matrix in which the artefacts are embedded is of little consequence with respect to postdepositional surface modifications, but, due to its abrasive effects, sand forms an exception. Van Gijn (1989, 55) states: '*All assemblages from a sandy matrix are reported to display at least some modifications; Upper Palaeolithic sites in Denmark and Mesolithic sites in the Netherlands, which are in both cases usually located on sand ridges, have consistently been rejected for microwear analysis.*' For the LRA the best results for microwear analysis have been achieved on LBK artefacts deposited in settlement pits in the loess. Wetland sites form good runners-up while tools from sandy upland locations are least informative (Van Gijn 1989; Schreurs 1992; pers. comm. A. Van Gijn 2006). Unfortunately most of the upland sites studied here are located on a sandy substratum. Currently no information is available on the qualitative and microscopic (*i.e.* phytolite) aspect of grinding stones for upland and wetland conditions. Evidence from wetland and loess (LBK) context yielded good results, but no stones from the sandy uplands have been tested. It is possible that the increased percolation of water and other substances through the soil might influence the potential of information available from upland sites (pers. comm. A. Van Gijn 2006). Apart from these aspects it should be mentioned that in general a remarkable amount of stone seems to be missing, preventing, for instance the refitting of stone. It is likely that this relates in part to behavioural factors. Sites may have been used as 'quarries' of raw material (see Schlanger 1992). Upland locations appear to have experienced longer surface exposure and were therefore potentially longer subject to these activities.

Pottery

In the LRA Neolithic pottery stands a much better chance of survival under wetland conditions than in the uplands (*contra* Groenewoudt 1994, fig. 7a). Pottery deposited in deep (LBK) pits is also well preserved, yet not all ceramics end up in features. Ceramics in wetland conditions also suffer from postdepositional processes (wet sherds soften and become more vulnerable; see Schiffer 1987, 160), but the upland pottery spectrum is severely affected by its prolonged surface exposure. Weathering by the elements and especially freeze-thaw cycles (*cf.* Skibo *et al.* 1989, for further discussion see Sommer 1991, 119-120) can destroy sherds within a very short space of time. Another important factor involved is the quality and texture of the clay, in combination with tempering agents used, and the firing procedure. The absence of SWB sherds in the uplands may relate to this problem, since the dispersal pattern of *Breitkeile* and certain lithics may indicate SWB presence there (see Niekus 2009; Raemaekers 1999; 2005[a]). Swifterbant pottery was made with a rather unstable firing technique, often in combination with the use of organic tempering agents and rather thick walls, preventing a well-fired result (De Roever 2004, 49, 120-122). The limited evidence for Hazendonk, Vlaardingen and Stein pottery from the upland Pleistocene soils may, apart from settlement location choice, also relate to the intrinsic qualities of their fabrication. It is of course difficult to assess what part of the original ceramic assemblage of a site will be preserved. The estimate for wetland sites is naturally dependent on the local conditions with respect to subsequent sedimentation. Usually the top of wetland sites will be exposed longer to 'dryland conditions', which will result in variable loss of part of the ceramic assemblage. On the other hand, pottery directly ending up in a wetland context such as a toss-zone in a swamp etc. will be better preserved, also in terms of size. The dryland estimate may be aided by a comparison of upland-wetland conditions for a number of sites (see table 4.2). Although on the basis of the current evidence it is not known to what extent these roughly contemporaneous sites are functionally comparable, they serve to show the relative difference between both geographical conditions (on a wetland dry to wet gradient, they could be listed as follows: St.-Odiliënberg-Neliske, Haamstede-Brabers/Swifterbant-S21-24, Schipluiden, Swifterbant-S3/Vlaardingen).

Carbonized and calcined remains

Carbonized organic remains such as charred remains of hazelnuts, charcoal and calcined bones are often the sole representatives of faunal and botanical remains in the uplands (see for instance the Mesolithic sites of Weelde-Paardsdrank or Bergumermeer-S64B, or Neolithic sites such as Helden-Panningen-industrieterrein or Koningsbosch in Appendix I). Survival relates to the replacement of organic matter by elemental carbon and other inorganic compounds, preventing biological decay (Schiffer 1987, 164). However, upland conditions are less conducive to the preservation of carbonized wood, *i.e.* charcoal, because of its extreme porous and brittle qualities, which make it very susceptible to physical decay. It is therefore reasonable to argue that charcoal, and to a lesser extent other carbonized organic remains, stand most chance of survival when present within features. However, with the exception of hearths, these are not common at upland sites. Furthermore while calcined remains of bone are more resistant to chemical and biological decay, there is a dramatic overall loss of strength induced by heating (see Nicholson

Site	conditions	excavation ext. m²	date cal BC	N sherds
S3/5/6	wetland	400	4300-4000	20000
S21/22/23/24	dryland	802	4450-4100	581
Schipluiden	(partial wetland)	5500	3630-3380	29957
St.-Odiliënberg-Neliske	dryland	4800	Middle Neolithic	100
Vlaardingen	wetland	4591	*c.* 3200-2600	30506
Haamstede-Brabers	dryland	1612	*c.* 2900	192

Table 4.2 Comparison of ceramic assemblages from three pairs of contemporaneous sites for upland and (partial) wetland conditions (see Appendix I for references).

1992, 79). The prolonged intense physical stress on bone in upland conditions will therefore have an effect on preservation; often any calcined bone that is preserved on upland sites is too fragmented for identification.

Botanical remains

As stated above, wood and other plant remains stand virtually no chance of survival in upland conditions unless they have been carbonised or deposited within micro-wetland environments such as wells (see for instance the wooden objects, wood and plant remains recovered from the LBK well of Erkelenz-Kückhoven; Weiner 1998[a,b]). In the wetlands wood and botanical remains are preserved quite well. At many sites (*cf.* Polderweg, Swifterbant-S3, Bergschenhoek, Hüde I, Schokland-P14, or Schipluiden in Appendix I) an elaborate analysis of these remains with respect to aspects such as subsistence, seasonality and past domestic use of wood and plant species is possible (*e.g.* Gehasse 1995; Out 2008[b]; 2009; Van Zeist/Palfenier-Vegter 1981). It should, however, be understood that most wetland sites only submerge gradually. The top of these locations, either dunes, levees, donken or other elevations, have usually suffered most from dryland conditions. It may be assumed that the amount of wood used for structures, implements and tools present on top of the dune as well as other botanical remains was once considerable.

Bone, antler and shell

Due to its tougher qualities, preservation of bone, antler and shell at upland sites is marginally better than that of wood and plants, but remains nihil in absence of calcination. Furthermore, different species of animals exhibit different preservation rates of bones and also within species some parts of the skeleton are more resistant to decay than others (Nicholson 1992). Physical weathering of bone is inflicted by exposure to heat (the sun), freeze-thaw cycles and water. Bone also deteriorates through chemical and biological agents (Schiffer 1987, 182-189). The acidic qualities of large parts of the sandy uplands are responsible for the lack of bone there, as is demonstrated by the rare and limited faunal assemblages and burials. Acidic soils dissolve the mineral fraction within the bone (*ibid.* 183). Decalcified soils, such as large parts of the loess stretches in the LRA also result in a bad preservation of bone. Exemplary is for instance the LBK cemetery of Elsloo (Modderman 1970, 45-75). Of the 66 inhumation graves located there only 18 yielded positive evidence for human burial in the form of corpse silhouettes. Apart from the above-mentioned factors influencing quantitative aspects of bone assemblages, intrinsic qualitative aspects also deteriorate. DNA for example is sensitive to temperature, but wetland conditions can be truly detrimental since the internal DNA structure is affected by micro-organisms in the water (see also Smits/Louwe Kooijmans 2006). Concerning isotope analysis, analysis of C, N and O isotopes which is mainly performed on collagen, might be more successful under wetland conditions since they inhibit microbial action. Sr isotopes on the other hand suffer from waterlogged environments, because the mineral fraction might be recrystallized, resulting in the loss of mineral signature (tooth enamel is often sampled since it is more resistant to chemical alterations; See Hedges 2002 for an overview of bone diagenesis). As with bone, virtually no Mesolithic or Neolithic data are available for antler or shell under upland conditions. At wetland sites the top of dunes and other elevations suffered more from these conditions.

Skin, hides, basketry, ropes and textiles

These categories of artefacts and remains have until now been non-existent at upland sites and also remain very scarce under wetland conditions for the period studied. This is undoubtedly in stark contrast to their abundance and importance at the time. Some sites such as Polderweg yielded pieces of rope made of bark-fibre (Louwe Kooijmans *et al.* 2001[a]). At Vlaardingen a birch bark box was discovered (Van Beek 1990; Glasbergen *et al.* 1961) and at Bergschenhoek pieces of rope (Louwe Kooijmans 1985; 1987). At Schipluiden the fills of two wells yielded some small fragments of woven fabric as well as pieces demonstrating a twining technique (Kooistra 2006). Textiles are extremely vulnerable. They either consist of plant fibres containing cellulose, or animal fibres containing keratin. Both are vulnerable to biological decay in the form of bacterial or fungal attack (Schiffer 1987, 181-182). Textiles, except when deposited under special conditions, decay before they can be preserved in waterlogged conditions. These special conditions may be the same that lead to the preservation of bog bodies (*i.e.* skin or hide); a very acidic environment (see Darvill 1987) and a direct and irreversible deposition.

Invertebrates

Invertebrates such as arthropods mainly provide ecological information as well as anthropogenically related information on waste disposal etc. The fact that they receive specific attention in the publications on Hardinxveld-Polderweg (Hakbijl 2001), Hoge Vaart-A27 (Schelvis 2001) and Schipluiden (Hakbijl 2006) is emblematic for their retrieval in wetland context. In general they are present but often overlooked if not especially sampled for. No substantial information on invertebrates is available for upland sites in the LRA.

4.3.2 Preservation of features

If we focus on evidence available in the form of features, differences between upland and wetland sites also become apparent. Apparently many features, especially when not including hearths, have been lost in upland contexts. One therefore encounters most features in the loess region, again mainly relating to LBK settlement context, as well as the wetlands. The Pleistocene sandy uplands only have a marginal count. Several reasons for this have already been touched upon above. The most plausible (but perhaps not solely occurring) explanation is probably the severe taphonomic disturbance of upland features (*e.g.* Burnez-Lanotte *et al.* 1996; Groenewoudt 1994; Vanmontfort 2004) through dissipation and soil processes.[2] This contrast becomes evident in table 4.3. Depicted are several (roughly) contemporaneous sites in the Late Mesolithic and Middle Neolithic of the LRA. Clearly visible is the contrast between wetland sites (in bold) and upland sites with respect to features.

One site that is clearly missing from the example above is Mariënberg. Over an area of 14000 m^2, the site yielded approximately 400 hearthpits spanning a Boreal and Atlantic occupation period of over 2500 years (see Verlinde/Newell 2006; Appendix I). This relatively high number of features for an upland context underscores the aspect of visibility. Apparently only qualitatively rich and contrasting features stand a reasonable chance of discovery in this area. Furthermore only Bergumermeer-S64B has yielded a considerable number of features even without the hearths.

Site (Mesolithic)	Area excavated (m²)	N features (hearths in brackets)
Hardinxveld-Polderweg (wet)	448	46 (6)
Weelde-Paardsdrank	337	4 (3)
Brecht-Moordenaarsven	172	(9)
Opglabbeek-Ruiterskuil	134	(2)
Bergumermeer-S64B	1200	47 (19)
Dilsen-Dilserheide III	146	-
Meeuwen-In den Damp I	648	-
Helmond-Stiphoutsbroek	2115	(1)
Lommel-Maatheide	85	-
Lommel Vosvijvers 3	?	(3)

Site (Neolithic)	Area excavated (m²)	N features (hearths in brackets)
Swifterbant-S3 (wet)	***c.* 400**	***c.* 650 (110)**
Schipluiden (partially wet)	**5500**	**4609 (56)**
Wateringen-4 (wet)	**2032**	***c.* 133 (1)**
Vlaardingen (wet)	**4591**	***c.* 2290**
Meeuwen-Donderslagheide	300	-
St.-Odiliënberg-Neliske	4800	>2?
Helden-Panningen-industrieterrein	9630	>3?
Koningsbosch	560	-
Linden-De Geest	2200	>1?

Table. 4.3 Comparison of number of features counted for several Mesolithic and Middle Neolithic upland and wetland (bold) sites.

This could be related to the fact that the terrain was eventually covered by peat (Casparie/Bosch 1995, 235). Unfortunately none of the features or contextual information has been published in any detail (see Newell 1980; see also Niekus 2012).

It can be stated that favourable conditions for the preservation of features in wetland situations are created by the temporally limited effects of bioturbation and the fact that most former habitation layers will be beyond the reach of many processes of soil formation. This also applies to sites that are situated in the upland-wetland margin (such as Schokland-P14 and Urk-E4) and that were only covered at a later stage. However, there is no absolute 'black-and-white' distinction between wetland and upland sites, since the former have all been exposed as well for a shorter or longer period and the subsoil of most wetland sites (apart from for example levee locations) also consists of a body of (dune) sand. Wetland sites therefore find themselves at the end of a qualitative (and quantitative) continuum.

4.3.3 Upland Bergschenhoek

Translating the difference of potential preservation on upland sites versus wetland sites into archaeological reality is often a difficult undertaking. It remains an estimation (see also fig. 4.2) that is dependent on a wide variety of anthropogenic and natural factors (see Schiffer 1995). Nevertheless, hypothetically positioning a site in a different context and extrapolating what information remains, may be altered or will no longer be found may serve as a tool for realising the actual

Bergschenhoek				
wetland reality		upland reflection		
finds	information	finds	information	
3 flint artefacts	*raw material provenience; (curated) technology; function*	3 flint artefacts	*raw material provenience; (curated) technology; function*	***finds***
fragm. stone axe	*technology; interaction; function*	fragm. stone axe	*technology; interaction; function*	
4 14C dates	*correlated dates*	1 14C date	*increased problems of contamination/association*	
pottery	*cult+chron. affiliation: middle phase SWB, southern group; repair holes: curation/availability; technology; local fabrication?*			
clay netweights	*technology; local fabrication; subsistence*			
reed bundles; wooden boards; small trees	*site re-use; investment; architecture*			
irregular boards of a canoe	*technology; transport; curation*			
4 fishweirs (dogwood)	*subsistence; technology; procurement strategies (passive fishing)*			
pointed sticks	*subsistence; technology*			
leister prongs	*subsistence; technology; procurement strategies (active fishing for leister)*			
pointed arrows (ash)	*technology; subsistence; procurement strategies (active hunting birds/mammals)*			
awl of birdbone	*subsistence; technology; maintenance activities*			
pieces of rope	*technology; use*			
superimposed hearths	*re-use; duration: 10-11 phases: 3-6 years*	charcoal scatter	*14C date; no association carbonized remains?*	***features***
dog	*site function: hunting?; subsistence?*			***fauna***
fowl (various species)	*subsistence; hunting territory; seasonality (winter)*			
fish (various species)	*subsistence; hunting territory; seasonality (winter)*			
mammals (various species)	*subsistence; hunting territory*			
botanical remains	*subsistence; seasonality; local procurement or dried/stored?*			***botanical***
	information on site function; group size; duration and permanency; investment; subsistence; technology; hunting territory; procurement strategies; maintenance activities; interaction; settlement systems; cultural affiliation		*some information on site size, function and interaction; vague chronological indication; no distinct spatial information*	***combined***

Fig. 4.3 Schematic representation of the dichotomy between upland and wetland sites as illustrated by the site of Bergschenhoek in its real and in hypothetical upland conditions.

differences between data sets with which we are confronted. One of the most emblematic examples is provided by the site of Bergschenhoek (see Appendix I). The site was situated at the edge of a lake in the vicinity of Rotterdam, north of the Rhine-Meuse estuary. It was a small fishing and fowling camp, centred around a hearth. It was visited and maintained for a period of some ten years. Regular quick sedimentation made for ideal preservations conditions for organic remains; therefore the site has yielded a wealth of information on past human activity and the way in which the site was used. In contrast lithic remains are relatively scarce. The theoretical exercise of transporting Bergschenhoek to the Pleistocene coversand landscape several kilometres further south is therefore especially telling with respect to the type of information that is lost (see fig. 4.3). Apart from the lithic remains (three artefacts and a fragment of a stone axe) not much information would have remained (see also Orme 1981, 33-42) and the site, if discovered at all, would probably have been interpreted as an off-site activity.

4.3.4 Artefacts, features and information

What may be concluded from this brief overview regarding the preservation of artefacts, other mobilia (faunal remains etc.) and features at upland and wetland sites is that there is no absolute distinction between both. Wetland sites at least partially harbour aspects such as exposure and soil conditions that are comparable to upland sites. On the other hand, the local conditions created by sedimentation of clay and development of peat and especially the ensuing anaerobic conditions create an environment that is much more conducive to the preservation of organic remains. Furthermore the absence of bioturbation and other physical and chemical weathering processes in the soil also positively affect the preservation of features to some extent. While we are in fact dealing with a continuum of conditions there is a distinction between upland and wetland sites which generally involves the notion that the overall level of information available at wetland sites will be much higher. This will evidently lead to more well-founded conclusions concerning the interpretation of past activities. This difference is schematically depicted in fig. 4.4.

4.3.5 Spatio-temporal patterning

Apart from the primary differences between upland sites and wetland sites with respect to the quantitative and qualitative preservation of artefacts and features, preservation of spatio-temporal patterning forms another important factor. Binford's initial optimism in 1964 (pp. 425; see also Binford 1962) about the existence of a fossil record of the activities of extinct society, before long gave way to an increased realisation of the various factors at play in distorting this record (*e.g.* Binford 1982; 2002(1983); Gifford 1978; Schiffer 1976). Various syn- and postdepositional factors influence deposited materials and features and as described above, qualitatively dependent on the upland or wetland context of a site, a continuous decrease of available information takes place. Apart from primary aspects of preservation of (parts of) the archaeological record, this also refers to the potential of inherent spatial and chronological information. The loss of spatial and chronological information might be defined as spatio-temporal collapse (Conkey 1987).[3] The degree of collapse is related to both natural and cultural factors. Cultural factors involve all anthropogenic activities taking place

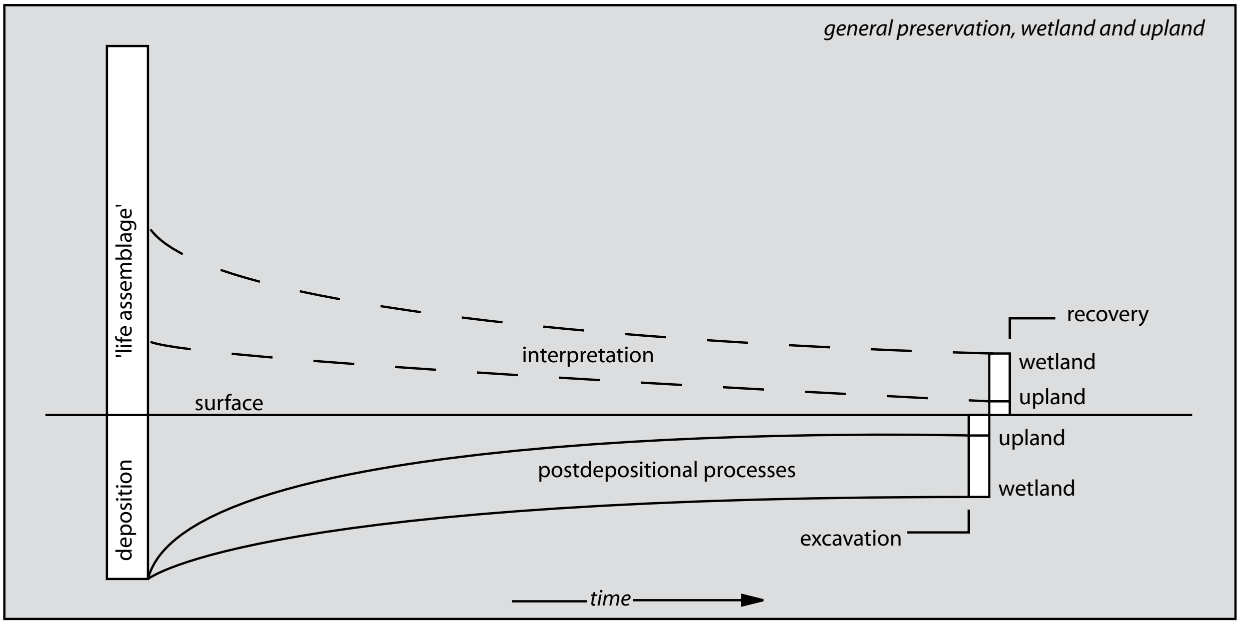


Fig. 4.4 Schematic representation of the contrast between information from upland and wetland preservational contexts. The more intensive exposure to postdepositional processes has impacted the quality of information available for upland sites to a greater extent. This results in less information for the reconstruction of past behaviour. (Note that the information that is excavated will always be less than the information that might have been excavated).

in the same location and resulting in an obscuring of the initial patterning. It is important to realize that there is a certain balance between the signal and noise and that repetition and redundancy of activities are not analogous to disturbance of patterning (see Sommer 1991). These cultural factors will be further discussed below. Natural factors can be subdivided into active and passive agents. Active agents are postdepositional processes responsible for spatio-temporal collapse (for instance bioturbation, argiliturbation, cryoturbation, erosion; for discussion and further references see *e.g.* Bubel 2002/2003; Schiffer 1987). Passive agents refer to the gradual or episodic burial of a site through sedimentation or submergence. This will by and large preserve a certain qualitative degree of the former spatial patterning. Objects and features become 'sealed' in context as it were. At the same time a layer of variable thickness is created enabling a temporal isolation of finds and features.

From wetland and upland contexts there is a gradual increase in the exposure to and the effects of spatio-temporal collapse. More often than not the level of information available for upland sites on stable surfaces will be a fraction of that of their wetland counterparts. In fig. 4.5 and fig. 4.6 both situations are visualized for 'single phase occupations.'

The figures demonstrate the differences in syn- and postdepositional processes, of both a systemic and natural background, acting upon the material remains of occupation. Of importance is the different degree to which the deposited sample, itself only a part of the former 'life assemblage', is affected by these processes, resulting in a qualitatively and quantitatively different excavation potential. The diversity in information available for wetland sites subsequently represents increased possibilities for reconstruction of the actual dynamic past of the 'life assemblage'.

Several factors are of importance that affect the spatial and temporal disintegration of information. Their impact is directly related to time and the development of a cover as can be seen in fig. 4.5 and fig. 4.6. A number of

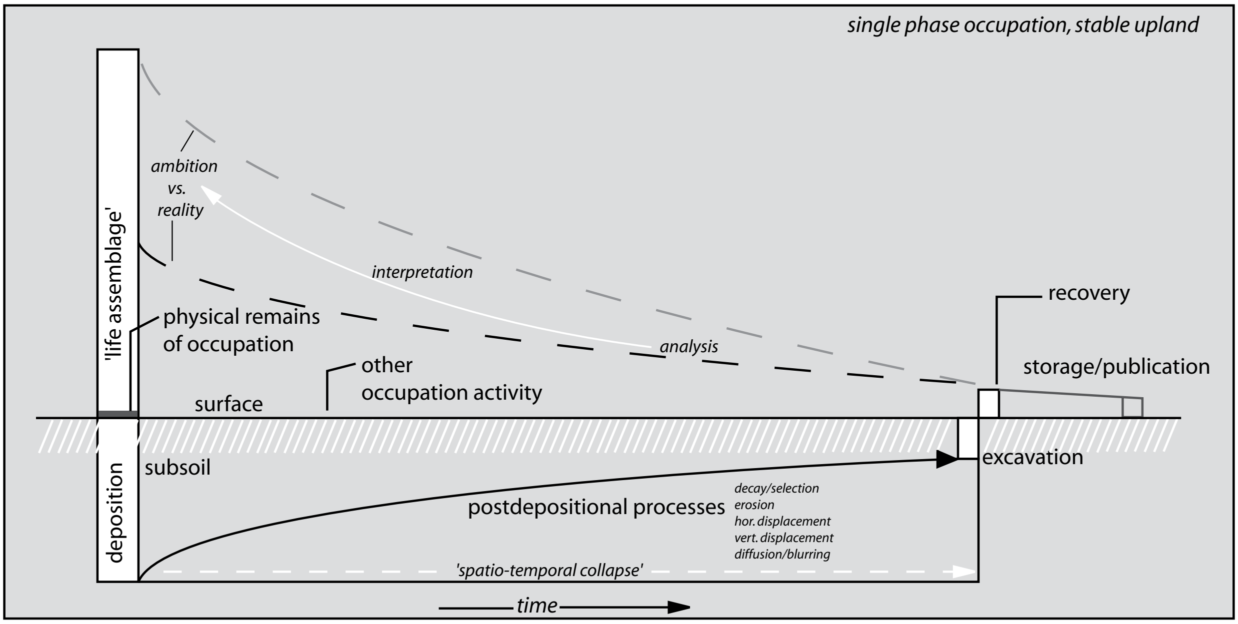


Fig. 4.5 Schematic representation of postdepositional and distortive processes for upland sites with a single phase of occupation. Note the decrease in information between the 'life assemblage', deposited assemblage and recovered assemblage in relation to analysis and interpretation.

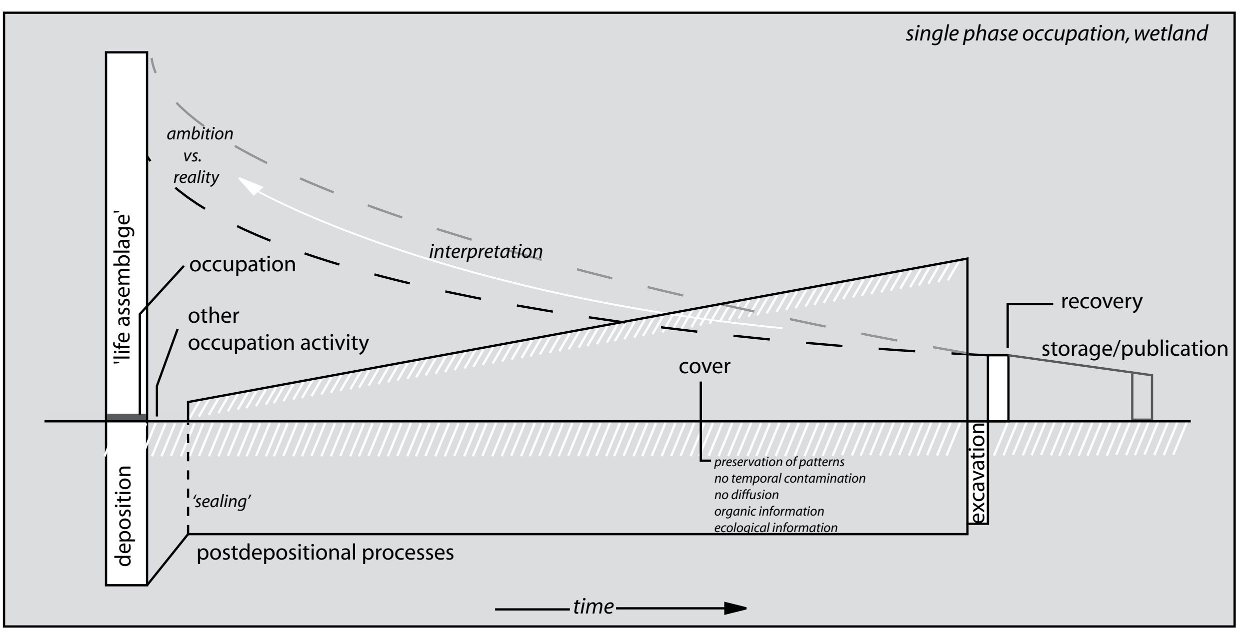


Fig. 4.6. Schematic representation of postdepositional processes and the effects of preservation for wetland sites with a single phase of occupation. Note the effect of 'sealing' on post-depositional processes. Compare 'ambition vs. reality' to fig. 4.5.

these factors that are of special importance for understanding the site formative processes in the LRA are discussed below.

4.3.5.1 Vertical displacement of artefacts

The vertical displacement of artefacts is brought about during the use phase of a site as well as after its abandonment and after burial of the assemblage (the biocoenose, thanatocoenose and taphocoenose stages of a site; see Schiffer 1987 and Sommer 1991). In the first case the artefacts are usually at the surface and a major influence in their disturbance is trampling (for an elaborate discussion see Schiffer 1987, 126-127). Bioturbation forms an important factor during the second stage.

Trampling

Trampling is dependent on the occurrence of remains on the ground, the intensity of the trampling and the nature of the surface (Schiffer 1987, 126). Longer surface exposure, as is the case with upland sites, leads to increased dissolution of patterning. Trampling has two general effects. Firstly, artefacts are physically affected due to pressure or contact-related stress. This leads to deformation such as chipping and abrasion of flint, breaking of bone and almost complete disintegration or crumbling of sherds (*e.g.* Van Gijn 1989; Nicholson 1992; Nielsen 1991; De Roever 2004; Schiffer 1987, 276-278; Sommer 1991). Although this destroys the primary information value of artefacts it leads to insight on another level, namely intrasite spatial organisation. Artefacts affected by trampling might be indicative of activity areas, structures and fixed routes within a settlement or campsite. At Schipluiden, for instance, a trampling zone substantiated the claim of the existence of a continuous fence for keeping out cattle (Hamburg/Louwe Kooijmans 2006). At Schokland-P14, Oudenaerde-Donk, and possibly at Ypenburg, trampling is also indicative for the presence and importance of cattle at these sites (see Appendix I). Furthermore it may be indicative of the use intensity of a site. At Swifterbant-S3 the combination of trampling-intensive zones with small sherds and areas where larger sherds were preserved was attributable to the presence of a house or hut and activities around hearths (De Roever 2004, 35-36), whereas at Hardinxveld-Polderweg the relative size of the sherds enabled a a distinction to be drawn between the intensively used lower slope of the donk and the surrounding marsh area (Raemaekers 2001[a], 114). Nevertheless, caution is warranted in the interpretation of trampling zones, since the presence of smaller fragments of for instance pottery does not directly signal intensively used areas. This is can also be dependent upon the differential rate at which a site has been covered by subsequent sedimentation as well as culturally specific modes of waste disposal among other things (see for instance De Roever 2004, 35; Sommer 1991).

In combination with other processes trampling is also responsible for vertical displacement of artefacts in the soil. Table 4.4 indicates that vertical dispersal of artefacts is a problem at Mesolithic and Neolithic sites, both on the uplands and in the wetlands (see also Villa 1982). Apart from trampling other factors are also responsible. At Swifterbant-S3 cryoturbation might be responsible for an increase in the percentage of flint in the upper layers (De Roever 2004, 33). Of much more importance, however, are the effects of bioturbation on the archaeological record.

An elaborate study of this effect, including experimental research, has been done by S. Bubel (2002/2003).

Bioturbation

Bioturbation can basically be subdivided into floral turbation and faunal turbation. Falling under the former category, especially wind throw or tree fall features have a huge impact (Bubel 2002/2003, 61-147). This is very clear at the site of Bergumermeer-S64B for example, where wind throw features obscure almost 50% of the horizontal and vertical information available. Furthermore they have often been misinterpreted as hut features or dwelling structures (see Newell 1980; see also Niekus 2012). Faunal turbation can be subdivided in turbation by earthworms, arthropods and mammals (Bubel 2002/2003; Schiffer 1987, 207-210). Concerning earthworms, Darwin (1883 (1881)) already noted their effect on the archaeological record. They are capable of altering the provenience and context of artefacts and also of blurring feature boundaries and stratification (Bubel 2002/2003, 167). The effects of arthropods are less known, but comparable. They prefer sandy soils (*ibid.* 188). Arthropods were partly responsible for destroying the spatio-temporal integrity of the Weelde-Paardsdrank site (Huyge/Vermeersch 1982, 132, 137). Depending on their size and number, burrowing mammals also disturb sites considerably. Often their impact is still visible in the form of so-called krotovinas (an animal burrow filled with organic or mineral material from another soil horizon), which also exist for earthworms and arthropods (Bubel 2002/2003, 229). Based upon experimental research simulating these *krotovinas*, Bubel concluded that size-sorting takes place. Overall the greater the size and weight of artefacts the deeper they were buried (*ibid.* 304). This was subsequently tested at, amongst others, the sites of Meeuwen-In den Damp I and Brecht-Moordenaarsven 2. Both, though Brecht to a lesser extent, confirmed the hypotheses generated by the experiments (*ibid.* 334-363, 438). Contrastingly, however, at other sites a reversed pattern seems to exist, for example at Merselo-Haag or Posterholt-HVR 165. In the latter case a tree fall feature had preserved the original find composition. This contrasted with the surrounding area where smaller pieces were embedded deeper in the subsoil and larger pieces remained on or at the surface and were displaced by ploughing (see Verhart 2002, see also Bubel 2002/2003, 27-32; Sommer 1991, 110). This pattern is generally explained by referring to the greater amount of energy involved in mass displacement of larger elements downwards (size sorting effect). It is thus important to realize that both situations might exist on the basis of the criteria mentioned above in combination with postdepositional processes (it is for instance likely that size sorting is less of a factor in displacement by tree falls or burrowing mammals).

Differential impact

It is important to note that especially sites with sandy sediments experience a high degree of vertical displacement (see also Bubel 2002/2003; Vermeersch 1999; Vermeersch/Bubel 1997). This means that especially the upland dataset studied here is seriously affected. Several reasons may be mentioned. First of all the often loose composition of sandy sediments is of a much more permeable nature than for instance loess or clay. Objects will be transported up and down with greater ease. Secondly, as was mentioned above, certain types of animals prefer sandy soils and their burrowing holes are probably less stable in these sediments. Of major importance however is the fact that Pleistocene sandy upland sites are exposed

Site	displacement	material	References
Brecht-Moordenaarsven 2 (u)	15-35 cm	flint	Bubel 2002/2003; Vermeersch *et al.* 1992
Dilsen-Dilserheide III (u)	≤ 60 cm	flint/pottery	Luypaert *et al.* 1993
Hardinxveld-De Bruin (w)	+	pottery	Raemaekers 2001[b]
Meeuwen-In den Damp I (u)	≤ 20 cm	flint	Bubel 2002/2003
Melsele-Hof ten Damme (w)	+	artefacts	Van Roeyen *et al.* 1992
Opglabbeek-Ruiterskuil (u)	≤ 15 cm	flint	Vermeersch *et al.* 1974
Schokland-P14 (u/w)	+	^{14}C sample	Lanting/Van der Plicht 1999/2000
Swifterbant-S3 (w)	≤ 40 cm	pottery	De Roever 2004
Weelde-Paardsdrank (u)	30-40 cm	flint	Huyge/Vermeersch 1982

Table 4.4. Several examples of Mesolithic and Neolithic upland (u) and wetland (w) sites in the LRA that yielded information on vertical dispersal.

to more prolonged and intensive bioturbation due to the absence of a preserving cover and waterlogged conditions. Bioturbation thus often continues for millennia whereas at wetland sites it is largely limited due to sedimentation, submergence or peat growth. Finally, upland sites lack the means to control or correlate for the effects of vertical dispersal. Different occupation periods are mixed, whereas at wetland sites intrusive elements and dispersal of related artefacts may be singled out and attributed to the correct layers (see for example Raemaekers 2001[b], 122-123; De Roever 2004, 37-38).

4.3.5.2 Horizontal displacement of artefacts

The counterpart of vertical displacement is horizontal displacement and many of the above-mentioned factors also lead to horizontal displacement of artefacts. Overall, the effects of bioturbation on horizontal movement might in most cases be considered to have less impact (see Bubel 2002/2003, 286, see also the effects of bioturbation on the site of Melsele-Hof ten Damme, Fechner/Langhor 1993; Van Roeyen *et al.* 1992). On the other hand, other factors might have seriously influenced the horizontal integrity of a site. Especially the proximity of running water in the form of rivers and streams can be influential (*e.g.* Jardinga and Liège-Place St.-Lambert in Appendix I). Trampling (and kicking etc.) also forms a serious factor. Especially on stable dry surfaces, continuous or repeated use of the same location can lead to considerable horizontal displacement of artefacts. At the Swifterbant-S3 site sherds of one and the same pot were found within a 20 m radius, although the majority was found within a couple of meters' radius (De Roever 2004, 37-39). At Weelde-Paardsdrank trampling might have been partly responsible for the distribution of artefacts over up to 25 m (*cf.* Huyge/Vermeersch 1982, 149). However, the distribution, especially of flint, might also relate to conscious activities like particular areas of waste disposal, curation of previously abandoned artefacts and scavenging of sites (see Schlanger 1992). Finally, various slope processes such as erosion and colluviation have a major impact on original horizontal patterning. These will be discussed below. As with vertical dispersion the effects of horizontal dispersion are also directly related to the use-intensity of a site in combination with the present conditions of sealing. From this it can be concluded that under conditions of equal site use intensity, the horizontal displacement of artefacts at upland sites will be more intense. Furthermore their shallow position near the surface makes them vulnerable to the effects of (deep)ploughing and other postdepositional activities.

4.3.5.3 Erosion, colluviation, slope effects and 'decapitated' sites

Almost all sites figuring in Appendix I and probably most of the sites known for the period under investigation are located upon an of elevation of some sort and origin (see table 4.5; see also Peeters *et al.* 2002, 105).

Sites that are not located on a distinct elevation or in a valley floor location, such as Jardinga, Bergschenhoek and Bronneger, may all have had a rather specific site function. From this it may be concluded that most residential or domestic settlement locations known from this period to some extent suffer from postdepositional effects related to slope processes. Together with the aforementioned trampling these processes distinctly transport or displace artefacts. This contrasts with most of the effects of bioturbation which mainly result in a smearing and blurring of intra-site patterns. Three important slope processes can be mentioned: downhill displacement, erosion and colluviation. The effects of all three naturally increase with the gradient of the slope. Hardinxveld-Polderweg and the Hazendonk for instance have a gradient of approximately 20%, while the Schipluiden dune is low and only has a low gradient of a few degrees.

A certain degree of downhill displacement of artefacts is very likely, especially when the elevation is still in use. Potentially the larger and heavier artefacts may cluster lower on the slope, since they are less easily embedded. The effects of this might, however, be limited as was demonstrated by the distribution of cores at Hardinxveld-De Bruin (Van Gijn *et al.* 2001[c], 160). Of considerably greater impact are the processes of erosion and colluviation. In combination with the slope gradient, trampling, soil creep and slope wash are important factors within these processes, as well as the degree to which past behaviour is influenced by the slope (distribution patterns of activity areas, waste disposal areas, tracks etc.). Archaeological remains as well as the surrounding matrix are mainly transported down the slope. At Hardinxveld-Polderweg and De Bruin colluvial layers were revealed in thin sections and, partially, through the sloping orientation of longitudinal fragments of bone and charcoal (see Louwe Kooijmans/Mol 2001; Mol/Louwe Kooijmans 2001). At these sites this led to a complex alternation of colluvial layers within the surrounding peat matrix. A colluvial zone also was identified at the foot of the much flatter and lower dune of Schipluiden, while erosion caused distinct gaps in the distribution patterns (Mol *et al.* 2006; Wansleeben/Louwe Kooijmans 2006, 75).

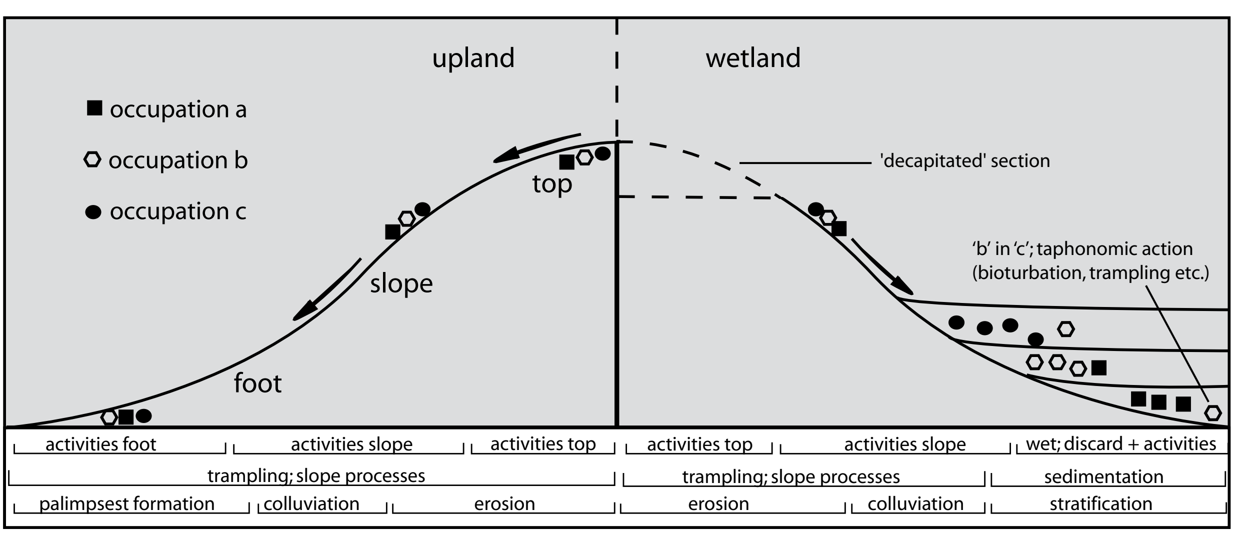
Location	**N sites**
coversand ridges or dunes	20
levees	6
river dunes or donken	5
coastal dunes or barriers	4
low elevations	3
upper terrace or valley margin	2
boulder clay outcrop	1
Other/valley floor	4

Table 4.5 Non-exhaustive but exemplary distribution of site locations scored in the catalogue (Appendix I).

Colluviation and associated processes

Two further effects should be mentioned that result from erosion, colluviation and associated processes. An important phenomenon at a number of wetland sites is the destruction or absence of spatial and chronological information deriving from the top of sites. Due to the lack of a cover in combination with intensive use and upland conservation conditions, objects as well as features become part of a palimpsest, but might also be partially or entirely absent due to continuous bioturbation, trampling and large-scale erosion (see for example the section drawings of the dune of Schipluiden, Mol *et al.* 2006, fig. 2.7). This leads to more or less 'decapitated' sites which especially lack information concerning activities and structures located on the top, which is often assumed to be the core habitation or residential area (see also fig. 4.7). Examples of 'decapitated' sites are Brandwijk, Hardinxveld-Polderweg, Hardinxveld-De Bruin, the Hazendonk, Hoge Vaart, Urk-E4 and Swifterbant-S21-24. At S21-24 the formation of the Almere lake in historical times caused the erosion of the covering peat as well as of the tops of the river dunes, resulting in decapitated profiles. At S21-24 this resulted in an erosion of 45 cm of the top of the dune (Ente 1976; De Roever 1976). At S23 erosion caused a virtual absence of finds from the top of the dune and at S21 some of the hearthpits might have been obscured by erosion (De Roever 1976; 2004, 27). Erosion would also have led to displacement of artefacts. At Schipluiden part of the feature level on the top was preserved, yet the entire occupation layer and internal spatial patterning had disappeared through erosion (Wansleeben/Louwe Kooijmans 2006). The decapitated profiles are partially down to the dry aspects and conditions of the tops of wetland sites and result in a selective preservation in zones. This represents a second effect in relation to erosion. Trampling and activities on the slope of a site will, in combination with water (rain), have led to colluvial processes. The main problem of these processes is the mixing of displaced (secondary) material from the slope with primary deposited remains at the foot of the elevation. Apart from spatial contamination of the existing patterning this also leads to chronological contamination (see fig. 4.7). Dependent on the rate of sedimentation or cover of the foot of the elevation, more or less admixture of older remains from the slope will take place.

Fig. 4.7 Influence of trampling, colluviation and slope processes on spatio-temporal information from upland and wetland sites. Note the 'decapitated' section of the wetland site.



It may be concluded that erosion, colluviation and slope effects affect every site located on a slope. Apart from the gradient of the slope, a sandy substrate, as is the case for most upland sites and the donken, is probably most vulnerable due to its loose internal structure. Furthermore, while the impact and scale of these effects might to some extent be similar for both upland and wetland sites, the means to identify and control them stratigraphically are usually absent at upland sites.

4.3.6 Persistent places and consistent use

Another aspect that should be discussed here is of a cultural nature and involves the regular or interspersed re-use of the same location for similar or different activities (see Binford 1982). This involves the resolution of redundancy and the visibility of patterns (see Sommer 1991, 61). Except for sites such as Bronneger and perhaps Gassel, most sites figuring in Appendix I show evidence of repeated occupation or use. This ranges from several years, as is the case for Bergschenhoek, to several millennia as was documented at Mariënberg. If similar activities were carried out, one could assume that the signal of these activities would be stable and readable. At Polderweg the patterning of and gradient in activities was to a great extent repeated with each visit (see Louwe Kooijmans 2003). At the sedentary site of Schipluiden, there is a distinct degree of spatial continuity in site layout and site structure and consistency in use. The location of the general habitation area as well as the site perimeter, marked by a fence, an area with waterpits and several dump and activity areas remains constant over time (see Hamburg/ Louwe Kooijmans 2006; Mol *et al.* 2006; Wansleeben/Louwe Kooijmans 2006). The recognition of these patterns was of course strongly dependent on wetland conditions and stratigraphic control, yet other factors are also of importance. These relate to similar cultural choices with respect to the spatial structuring of the site, or returning to the same places.

Apart from the intra-site consistency in use of a location, the development of 'persistent places' over time may have numerous reasons, ranging from strategically positioned locations for hunting or seasonal activities and or investment in (fixed) facilities to the presence of (re-)useable material or the social attachment to a place (Barton *et al.* 1995; Schlanger 1992). The frequent return to sites over time of course also affects archaeological patterning and information at these locations, especially when immediate cover is absent. From a semi-Braudelian (1966) perspective three different time ranges may be defined that help explain the cultural messiness of site patterning. These are briefly discussed below.

4.3.6.1 Short duration – direct change

In this case activities performed at sites during one period of use or occupation have no fixed location. They shift from day to day, hour to hour, or person to person. Cultural debris, often in the form of waste, is left at the place of use or origin (*e.g.* knapping debris). Except for hearths, other fixed structures and built environment of some size are mostly absent (these often function as structuring and directing elements for fixed site patterning, see Binford 1987[a]). Schiffer (1972) argued that these situations exist at sites that are occupied for a brief period of time by a limited number of people. He proposed that with increasing site population (or perhaps site size) and increasing intensity of occupation, there will be a decreasing correspondence between the use and discard locations for all elements used in activities and discarded at a site. Therefore these short-term locations will consist mainly of primary refuse, clustering in discrete or overlapping locations (Schiffer 1972, 162; see also Rafferty 1985). Although this observation is a case in point it also calls for a certain reservation. Ethnographic analysis (*e.g.* Kelly 1992; 1995; Sommer 1991) has indicated that the cultural variability with respect to sites and site structuring is very large. 'Laws' as defined by Schiffer might form an observable general trend, but there are exceptions to the rule. An example at a different scale for instance is the mobile nature of cedar plank houses built by Northwest Coast people that could be moved seasonally (*e.g.* Ames 2006; Kelly 1992). Another example is formed by the fact that sites might be structured according to their anticipated use, which need not be similar to the actual use of a site (Kent/Vierich 1989, 124). In general it may, however, be concluded that short repetitive stays or uses of a location will often be characterized by a (somewhat) indiscriminate use of space. And therefore by less distinct patterning. On the other hand, if the activities are homogeneous (not unlikely in a hunting camp), the resulting waste is limited and spatial overlap is not conditioned by the layout of the location (*i.e.* there is enough space), then the archaeological patterning might be relatively clear and informative. Overall the above-mentioned type of site patterning is characteristic for short-term hunting or maintenance camps, overnight stays etc., but this is no definitive classification.

4.3.6.2 Medium duration – mobility and the seasonal round

Of a different magnitude is the aspect of mobility and the seasonal round. Within the time period under investigation we are largely dealing with non-sedentary hunter-gatherers and early farmers, which is why the existence of settlement systems, seasonal rounds and site diversification adds another dimension to the problem. Binford, after defining between systems of logistical and residential mobility in his famous 'Willow smoke and dogtails' article (1980), came to the same conclusion in his article 'The archaeology of place' (Binford 1982). In it, he acknowledged that '*the same places have different economic potential relative to the sequence of base camp moves*' (1982, 12). This implies that what is a base camp at one moment in one season, might in the following season function as a hunting camp, an observation stand, a logistical camp etc. Archaeologically this implies that '*the locations preferred for residential camps can be expected to yield a most complex mix of archaeological remains since they were commonly also utilized logistically when the residential camps were elsewhere*' (1982, 15). Re-using the same location for different activities with a different material signature will blur the original patterning that existed. To this one might add further complicating factors such as irregular use or hiatuses in use of the same location, re-use or scavenging of materials present at the site, shifts in the number of users, due to for example group fissioning, or cyclical patterns with a longer than annual cycle (long-term mobility; *e.g.* Schlanger 1992, 99). In correlation with Schiffer's intensity argument Binford argues that '*the overall effect of reduced residential mobility among logistically organized hunters and gatherers, from the standpoint of patterning, would be an archaeological record characterized by better defined "types" of sites giving the appearance of greater specialization in functions…*' (1982, 21). What this means is that with an increased level of sedentariness the subsequent 'sedimentation' of functions in the landscape could potentially lead to increased archaeological visibility. This is why it is important to address the issue of the degree of permanency (*cf.* Louwe Kooijmans 1993[a], 90-92, see also Rafferty 1995) when studying a site in the period under consideration. The seasonality aspects of the site of Hardinxveld-De Bruin give a good example of the problem defined above. There are faunal and botanical indicators for a presence in every season, yet on the other hand the limited dimensions of the drowning donk would appear to cast doubts on a permanent year-round occupation. The most likely explanation seems a continuation of the winter basecamp function of Polderweg in combination with a logistical function at other times throughout the year (Louwe Kooijmans 2001[b], 513-514). It should be realised, however, that even at a wetland site with qualitatively good preservation, one faces a complex palimpsest of remains of different activities.

4.3.6.3 Long duration – persistent places

In a long-term perspective the comprehension of archaeological patterning is hampered by cultural and natural factors and patterning on a larger time-scale. This involves the re-use of specific site locales over extended periods of time, often with hiatuses in occupation lasting anywhere from several centuries to millennia. Louwe Kooijmans referred to this as '*the duration of occupation at a certain location*', which can be '*measured in years and irrespective of the permanency-factor, can be seen as reflecting the continuity and especially the stability of the community*' (1993[a], 90). However, realising the time depth recorded for some sites such as for example Mariënberg, Bergumermeer-S64B or Hoge Vaart-A27, in combination with the hiatuses in occupation, suggests that apart from those sites that remained of importance over many generations and centuries, non-related communities also made use of the same locations over long time-spans. This means that particular site qualities, such as desirable geographical and ecological circumstances, rather than stability and continuity in community site use will have been an important factor. On the other hand long-term memory of places and their existence on mental maps, even in the face of long hiatuses cannot be ruled out (Feld/Basso 1996; Jones 2007; Van de Noort/O'Sullivan 2006). In either case we are dealing with sites that were the object of a long-term focus of one or several communities. A useful approach for studying these sites was presented by Schlanger (1992). In a study of Anasazi settlement patterns near the Dolores river in Colorado, Schlanger argues for a more flexible use of concepts such as site and find by replacing them with the concept of *persistent place*. Persistent places are locations that were repeatedly used during the long-term occupation of a region (Schlanger 1992, 92). Analogous to Binford's analysis (1982) the locations might also change function during re-occupation. A site with a residential focus may for example change into a location with a logistical focus, or into a special activity site. What is different about Schlanger's approach, however, is that shifts in site function are not related to a seasonal round, but to long-term changes in settlement pattern, for example in response to climatic and environmental changes (*ibid.* 93-95). The concept of persistent places will return later on (Chapters 5 and 8; see also Amkreutz 2013[a,b]). It is, however, evident that many such places existed in the LRA. A good example is Mariënberg (see also Appendix I). Within a set of 41 ^{14}C dates spanning a period between roughly 7600 and 5000 cal BC, Newell and Verlinde were able to distinguish four main occupation phases separated by three substantial hiatuses. On statistical grounds they defined another eight short hiatuses, resulting in twelve chronologically and spatially separate occupation phases (Verlinde/Newell 2005). Another example is the Hazendonk site. Over a period of more than 1500 years it witnessed occupation by Swifterbant, Hazendonk and Vlaardingen communities. There are even traces dating to the Late Mesolithic. In between some of the occupation periods there were (extended) hiatuses (see Appendix I; Louwe Kooijmans 1993[a]). Other sites that may be characterized as persistent places are, for example, Schokland-P14, Swifterbant-S21-24, both Hardinxveld sites, and Brandwijk.

Persistent places and long-term patterning form a last cultural factor influencing spatio-temporal resolution. While the former two time-frames involved limited spatial distinction in activities or different activities over the year, distortion at this level involves long-term shifts in the use of locations by different groups. Due to changes in natural or other circumstances this means that the type of activities at a location may diverge considerably from previous occupation or use phases. It is meanwhile evident that the degree to which these different use phases of a site may be distinguished is dependent on the degree to which there may have been a sedimentation episode or cover. It is evident that under upland conditions material from chronologically widely distinct use episodes of a sites may end up in the same context. Typical difficulties in interpretation may arise from this. Examples are the intrusion of pottery in a Mesolithic hearthpit at Swifterbant-S23 (see Appendix I; Price 1981; De Roever 2004, 27) or the presence of a MK vessel at a Mesolithic site in Dilsen (Amkreutz *et al.* 2010).

4.3.6.4 Dealing with scales of patterning and disturbance

The three time perspectives described above, each have a profound impact on sites, intra-site patterning and the information we may extract from it. Matters are complicated due to the fact that all three scales operate simultaneously, making it difficult to define the proper agents responsible for the patterning (or lack of it) that is discovered. It may be evident from the previous discussion that the impact of repeated use of sites within these different scales differs considerably in relation to site formative processes taking place (or the absence thereof). Again the difference between upland and wetland sites is evident. It is especially the absence of a potential cover or sedimentation at many upland sites, in combination with surface stability and continuous bioturbation and slope processes, that inhibits the distinguishing of different episodes of use over time. This is depicted in fig. 4.8 and fig. 4.9.

In fig. 4.8 two phases of occupation are depicted with an intermediate hiatus. During the period of occupation (indicated by the width of the bar), material accumulates (indicated by the height of the bar) and becomes deposited on and in the subsoil. From this moment on, various syn- and postdepositional processes start working (trampling, gnawing, re-use, scavenging, loss etc.). The grey shaded area is the eventual accumulation of debris and its internal structuring that form the material reflection of the entire period of occupation. This will likely, at least to some extent and depending on the spatial separation and period of use of the site, be a palimpsest. After abandonment of the site postdepositional processes further affect the deposited remains and continue to destroy intrasite patterning. During this process a second occupation takes place, this time less extensive and

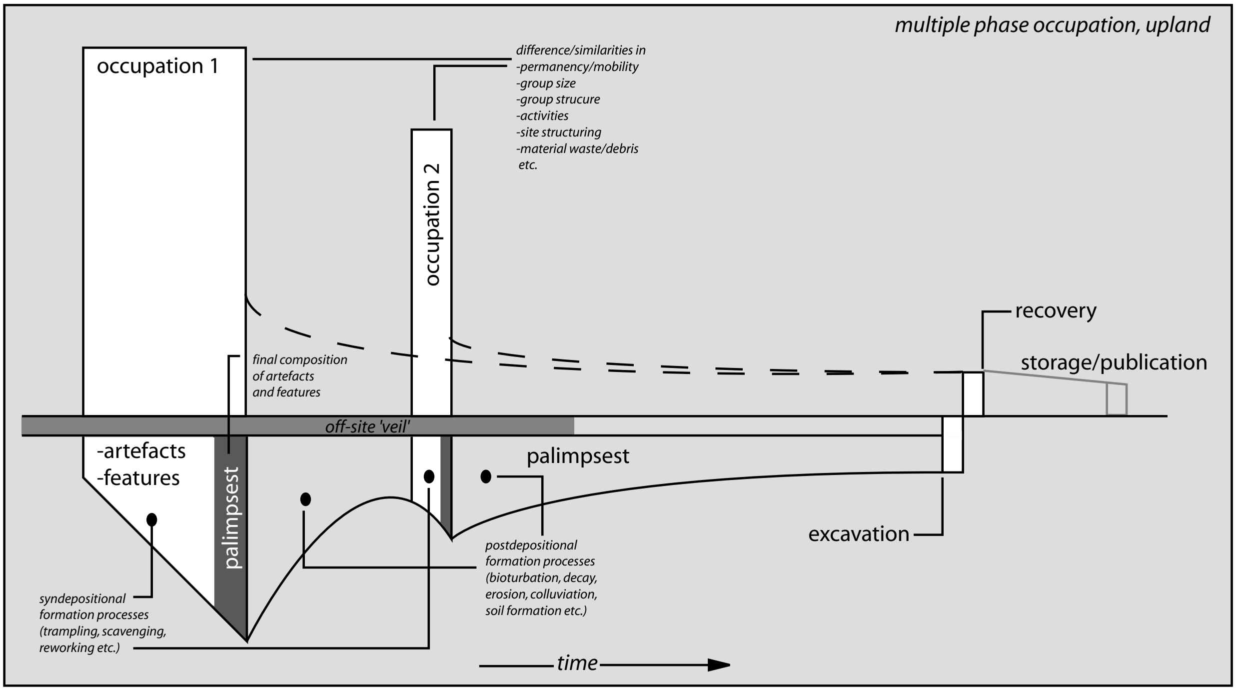


Fig. 4.8 Schematic representation of syn- and postdepositional processes and the effects of multi-period occupation on upland sites. Note that the superposition of the occupational remains of different non-related periods of site-use, in combination with the absence of a cover contributes significantly to the palimpsest character of the site.

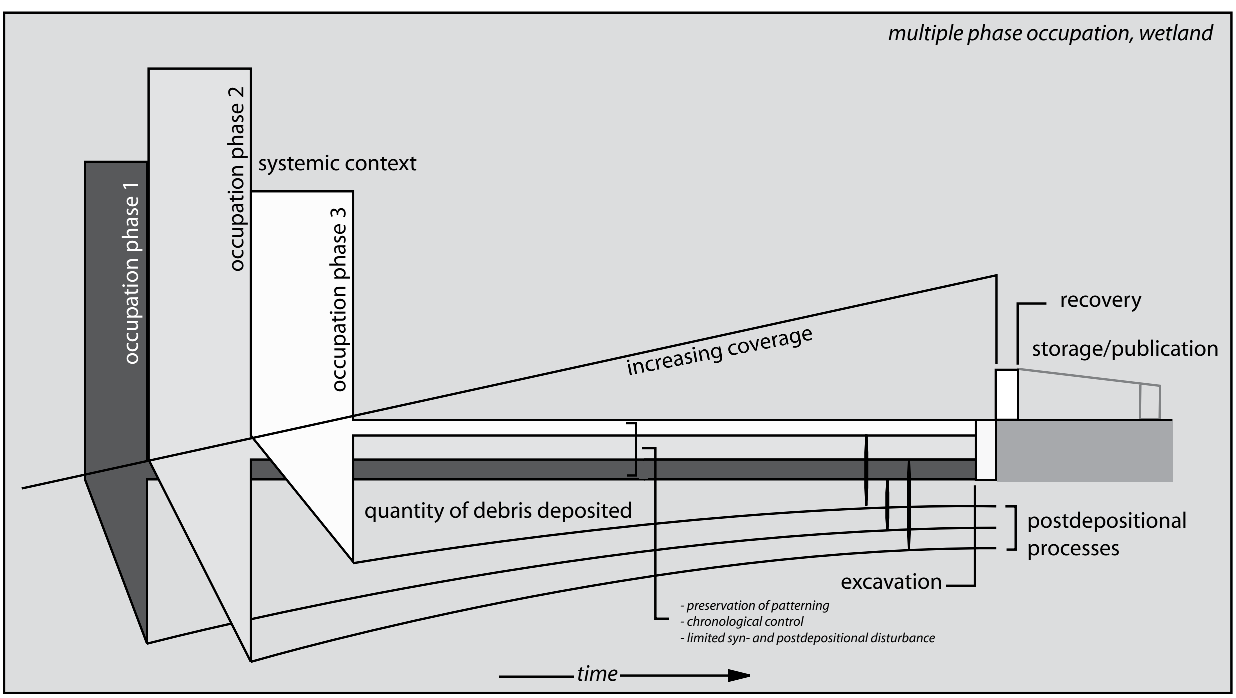


Fig. 4.9 Schematic representation of syn- and postdepositional processes and the effects of multi-period occupation on wetland sites. The frequent cover of a site during or after periods of site-use leads to the formation of stratification and subsequently spatio-temporally separated evidence of occupation.

with a more limited material impact. The material record on and at the surface is enriched by this second phase of occupation which might have a very different character and output compared to the first. The grey shaded area again indicates the eventual accumulation of artefacts and features. It is likely that the previously existing 'signal' of the first occupation will be further obscured by the second. Again syn- and postdepositional processes act upon the archaeological record. A further complicating factor is depicted in the horizontal bar. The 'off-site veil' is a concept coined by Roebroeks *et al.* (1992) to describe and interpret a Middle Palaeolithic low-density scatter, contrasting with high-density patches (see also De Loecker 2006). In the model above, the presence of an off-site veil serves to indicate that the sites we define are also part of a landscape of activities. The reason we identify these locations as sites is the concentration of relics and features at these places. This indicates that part of the material record at the site may also be part of the overall scatter or veil instead of belonging to the patch or concentration defined (see also Roebroeks et al.1992, 11-13). The veil might consist of a variety of small-scale activities that, amongst others, took place at that location. These activities might form part of one of the cycles or time perspectives described above. Due to the stability of the landscape the chronological and spatial separation of activities related to either the occupation of the site, or to the veil, is lost. Eventually the site might become buried, but due to its upland conditions burial will often not be very deep, nor will postdepositional processes cease to distort what is left until excavation. Examples of sites that on the whole fit this schematic representation are, for example, Bergumermeer-S64B, Brecht-Moordenaarsven 2, Koningsbosch, Merselo-Haag and St.-Odiliënberg-Neliske (see Appendix I for details).

In contrast fig. 4.9 depicts a wetland situation with three phases of occupation, differing in length and material output. No elaborate hiatuses are observable between the phases of occupation, but these could very well be imagined. After deposition the material record of each phase was again subjected to syn- and postdepositional processes. The main difference with the upland situation, however, apart from the potential waterlogged conservation of organic remains, is the development of a cover. Due to the non-stable character of this cover each occupation period may witness individual 'sealing', preserving intrasite patterning and providing a degree of chrono-stratigraphic control during excavation. Intermixing of anachronistic site- (or veil-) related activities and their material debris will be more limited and a better grasp on intrasite structuring within a syn- and diachronic perspective is possible. Sites that match this profile (although with different length and frequency of occupation) are, for example, Hardinxveld-Polderweg, Hardinxveld-De Bruin, Bergschenhoek, Brandwijk, Hazendonk, and Schipluiden (see Appendix I). As was noted earlier, chronological separation of different use phases may take place at these wetland sites, but often does not include the entire site. Often the top is characterized by long-term upland conditions while sedimentation and submergence (and the resulting spatio-temporal control) feature on the slopes.

4.3.7 A continuum of conditions

Of course the distinction sketched above for upland and wetland sites with respect to occupation phases and syn- and postdepositional processes is far from absolute. The models presented should rather be perceived as opposite ends of a gradual sliding scale very much dependent on the specific geomorphological specifics of the site location, the intensity with which the location is used and the nature as well as the moment of the creation of a cover through sedimentation or submergence. The site of Hüde I provides a good example. Located in the marshlands on the southern shore of Lake Dümmer, the site is ideally situated for good preservation. Nevertheless a considerable difference exists in the preservation between different layers. The lower find horizon (*Unteren Schicht*) is much better preserved. Especially towards the edges of the settlement this layer yielded spectacular remains in the form of the remnants of six potential huts, constructed of posts and beams. Parts of walls, the floor and other structures were also documented and most finds belonged to the earlier pre-TRB phases of occupation (Kampffmeyer 1991; Stapel 1991). This excellent preservation is down to the fact that during this phase the site was partially or completely surrounded by water because of the active channels of the Hunte river. As the documented structures bordered on the channel delimiting the site to the northeast, frequent flooding must have taken place (Kampffmeyer 1991, 66-71). Eventually alder carr or peat deposits (*Bruchtorf*) covered parts of the site. Contrastingly, the upper layer (*Oberen Schicht*) consisted of compacted peat harbouring charcoal, wood and other finds (Deichmüller 1965; 1969). This layer contained finds from all periods, indicating that it had been subject to serious trampling, compression and soil formation (see Kampffmeyer 1991, 74). Little spatial information was available for the upper layer and not many posts were found (see also Appendix I). It is most likely that the later phases of Hüde I were exposed for extended periods of time resulting in accumulation and compression of archaeological remains. It may be concluded that rather extreme differences can exist within the preservation of remains at the same location that develop over the span of several centuries or perhaps even decades. Another example is provided by the site of Schokland-P14. There, repeated sedimentation on the lower slopes has led to an internal stratigraphy subdivided into five phases (A to E; see Ten Anscher 2012; Gehasse 1995, 27). The first of these, however, already spans a period of no less than eight centuries. This indicates that the presence of covering sediments in a wetland location is no guarantee for the preservation of remains, or for spatio-temporal information. It should be noted then that although a general upland-wetland distinction may be made, favouring the latter in issues of organic preservation as well as spatio-temporal information and chrono-stratigraphic control, this is an artificial distinction. All sites in fact are positioned along a continuum and their information potential is shaped by locally variable natural and systemic factors that influence preservation and level of information. For the period and area studied it is, however, the wetland side of this spectrum that has yielded most information.

4.4 Methodological perspectives

The regional differences sketched above in organic and spatio-temporal preservation and the differences in opportunities these offer with respect to qualitative information also have repercussions for the way in which sites have been and are excavated. In the following, several characteristics of these methodological aspects will be presented. First, a number of theoretical considerations affecting both natural and cultural factors influencing the composition of the archaeological record will be discussed. Subsequently a brief and general overview of the main research tradition in the LRA with respect to Mesolithic and Neolithic research will be sketched. This is followed by a number of methodological contrasts and approaches in regional and period-specific research.

4.4.1 Theory for patterning

For interpreting the patterns we deal with at sites in different environments a good understanding of the various factors that influence our regional datasets is a basic requirement. An overview of these processes with respect to site formation and taphonomy was given in the previous paragraphs. This information forms part of a set of filters that stands between our interpretation, which is based on what we excavate and, what Binford (1964, 425) has termed, the 'fossil' record of the actual operation of an extinct society. Especially in the positivistic era of 'New Archaeology', it was argued that certain heuristic methods would enable a better understanding of the relationship between the static archaeological record and past dynamic systems (*e.g.* Binford 1977; 1981[a,b]). An important example of this set of 'middle range theories' (see Rowley-Conwy 2004) was for instance the body of theory dealing with the factors surrounding the discard or deposition of artefacts and their subsequent archaeological recovery (Gifford 1978; Ratjeh 1974; Schiffer 1972; 1987; 1995). Schiffer's (1972, 14-15; 1995, 28-41) distinction between archaeological and systemic contexts and the natural and cultural transforms (C-transforms and N-transforms) operating between them remains a valuable approach for defining various processes affecting assemblage formation. Another useful perspective is offered by a number of studies distinguishing the various stages in processes acting upon the archaeological assemblages (*e.g.* Clarke 1973; Eggers 1959). One of the most comprehensive of these originates in palaeontology and distinguishes between four different stages of archaeological assemblages and the intervening processes (see Schiffer 1995; Sommer 1991. Activities and artefacts work or move between these assemblages, which range from a *biocoenose* (life community or assemblage), through a *thanatocoenose* (death assemblage) and a *taphocoenose* (burial assemblage) to an *oryktocoenose* (excavation assemblage). Defining how various processes act between and within these stages is very helpful when interpreting the way in which data has been patterned. A further contribution that is valuable in this respect is Binford's (1980; 1982) emblematic demonstration of the way in which sites develop into palimpsests by repeated (seasonal) site use, often with a different purpose.

Information, interpretation and redundancy

This body of theory helps to explain how archaeological information yieldsed to us over time. In this respect it informs us which crucial conditions have to be met for archaeological visibility. According to Gifford (1978, 98) there are three:

- Human activities have material consequences
- These material consequences must be potentially preservable
- Natural processes must act in such a manner as to preserve them

Sommer (1991, 60) identified a fourth:

- Anthropogenic artefacts and features must be recognizable as such

These points are 'basic knowledge' yet they are at the core of archaeological discourse. In line with them the archaeological procedure as a whole can best be classified as an internal paradox. Past dynamic communities generate a static pattern of cultural debris and potential information. This static pattern is then, partially preserved and varyingly distorted, transferred to the present day where it is documented by archaeologists.[4] Following this, what was recorded of the static pattern is used to arrive at statements concerning these past dynamic communities, aided by external information and experience. Within this classification two general processes are at work. On the one hand there is a decrease in the transfer of information; a signal, hampered by noise moving upward through the various filters. On the other hand a process of increasing interpretation moves in the opposite direction. In order to arrive at balanced statements on the dynamic aspects of past communities, we are dependent on both our capability to identify and compensate for the intervening processes of site formation as well as our willingness to keep an open mind with respect to the interpretation of past behaviour (see fig. 4.10).

A final factor of importance in interpreting current patterning is the behaviour of past communities. Crucial in this respect is the concept of redundancy, which implies the level of repetition generating a pattern. There is a delicate balance between repetition and recognition. The 'signal' of a hunting camp (*e.g.* Bergschenhoek, see Appendix I) may go unnoticed if the material correlates of the activities taking place there are too limited. Repetition of these (hunting and fishing) activities and accumulation of the associated material debris may, however, enable archaeologists to distinguish 'the signal' from the noise (other activities or taphonomic processes). On the other hand, the ongoing repetition of signals and their material repercussions in the same location will eventually again distort the information available and turn into noise once more. This is, in fact, palimpsest formation (see fig. 4.11; Bailey 2007). Sommer (1991, 61) points out that 'signal' and 'noise' are not absolute concepts. Due to repetition and other activities, the signal of a specific intrasite activity might turn into noise, while this same noise

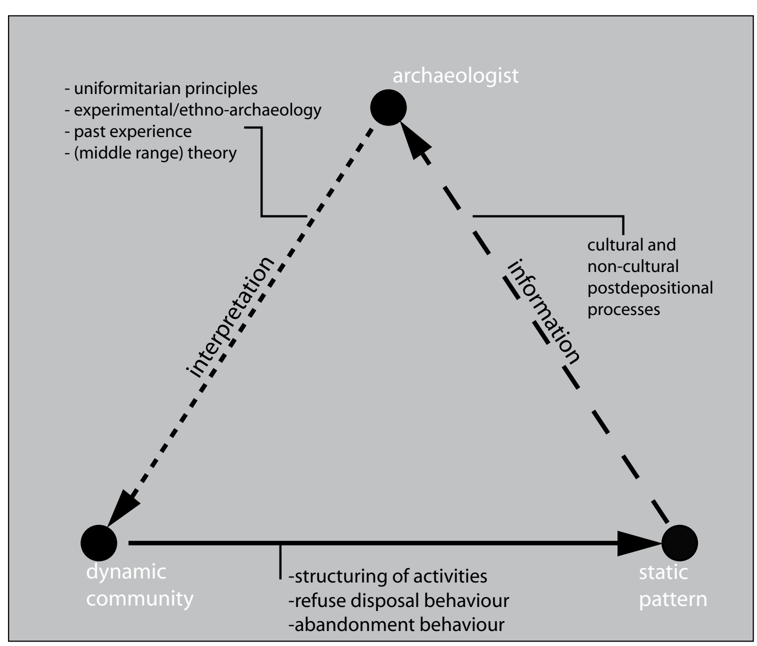


Fig. 4.10 Schematic representation of a number of factors and processes influencing patterning, information and analysis during the various stages of site formation and development of archaeological information.

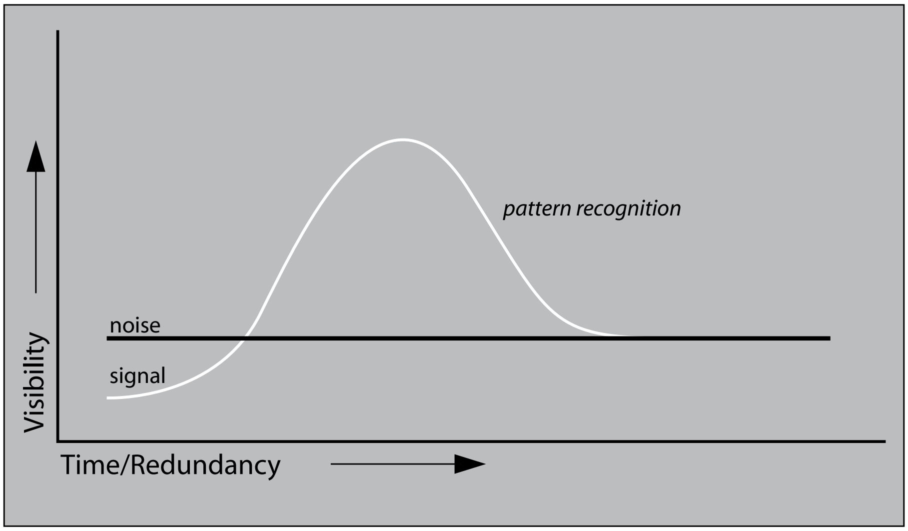


Fig. 4.11 Schematic representation of redundancy, 'signal, 'noise' and pattern recognition. Note that repetition and redundancy may both promote as well as distort the visibility of a signal.

again forms a signal on a higher level. For example retouch activities of points might get lost within the overall knapping debris, which in turn is indicative of an activity area on the level of the site. Realisation of the scale and resolution of the data available and adjusting the scope of the questions we ask and the type of research conducted is therefore crucial in understanding past patterning. It also forms the basis for explaining the (historical) differences in regional research traditions.

Reflections on Mesolithic and Neolithic perspectives

Apart from the theoretical background to the formation of regional information that may be sketched for the LRA, a further point of attention for understanding research approaches is formed by the specific connotations of the chronological division into a Mesolithic and Neolithic period.

It should be noted that archaeological discourse has long since moved on from any earlier stereotypical idea of opposing lifeways of hunter-gatherers and farmers (*e.g.* Childe 1952; see also Pluciennik 1998, 63). Based on ethnographic as well as archaeological studies the awareness arose of variation and mixing between these different categories (see Clark 1952; Lee/DeVore 1968; Zvelebil 1989). Nevertheless, as argued earlier (see Chapter 3) the concepts of Mesolithic and Neolithic are retained as heuristic categories that serve for studying past communities. This also means that they may, on a subliminal level, influence archaeological excavation and interpretation (Strassburg 2003, 542-544), simply because many of our methodological tools and approaches are derived from one or the other tradition of research and analytical thinking. In dealing with sites that may be positioned within a process of Neolithisation, harbouring aspects of both lifeways, it is important to be aware of this.

4.4.2 Research traditions in investigating Mesolithic and Neolithic sites

Situated between the Eastern European and French continental traditions focusing on data and classification and the Anglo-American theory-driven approach, archaeology in the LRA has long found itself in an intermediate position. The focus was mainly on data and the paradigmatic shifts experienced elsewhere were only pragmatically incorporated. For the second half of the 20th century, a number of influences may be mentioned briefly. It should be noted, however, that this is not an exhaustive analysis of research traditions and influences.

A first tradition is characterized by the functionalist and ecological approach, mainly originating from the post-war BAI (currently GIA) in Groningen (Waterbolk 2003), which was also implemented at other Dutch institutes in Amsterdam and Leiden. This approach might be characterised as ecological because of the relative importance of zoological, botanical and palynological studies. It has had an important influence on Meso- and Neolithic research in the study-area (*e.g.* Bakels 1978; Clason 1967; Groenman-van Wateringe/Jansma 1969; Waterbolk 1954) and continues to do so (*e.g.* Bakker 2003[a,b]; Out 2009). A second influence, dating to the 1960's and 1970s, is the positivist processual approach of New Archaeology, generated by several visiting scholars from abroad. They mainly focused on the Mesolithic and the transition to agriculture in the Netherlands and introduced elements of testing, statistics and spatial analysis into Dutch archaeological discourse (*e.g.* Newell 1970; 1980; Price 1978; 1981; Whallon 1978).

In the meantime German research concerning the Mesolithic and Neolithic in the study area was mainly dominated by the extensive LBK- and Rössen excavations of the Aldenhovener Platte (*e.g.* Lüning 1982[a,b]). These investigations can be seen in the light of the extensive research into *Siedlungslandschaften*. Analyses to a significant degree also focused on the sequencing of artefacts and chronology (*e.g.* Arora 1976). Much research in Belgium, apart from several LBK and MK excavations, focused on the Mesolithic (*e.g.* Gob 1981; Vermeersch 1984; 1989). Next to chronology and typology the Leuven school also meticulously excavated several sites such as Weelde-Paardsdrank and Brecht-Moordenaarsven in order to investigate aspects of spatial analysis and taphonomic disturbance (Huyge/Vermeersch 1982; Lauwers/Vermeersch 1982). Simultaneously the low-lying parts of the LRA saw the development of a wetland excavation tradition, characterized by the combination of various sources of information, mainly because of the preservation of organic remains. Excavations at Swifterbant fall within this spectrum as do those at Hekelingen and Vlaardingen (*e.g.* Deckers *et al.* 1981; Modderman 1953). Recently excavated sites within 'Malta archaeology', such as Hardinxveld-Giessendam, Hoge Vaart, Ypenburg, Doel-Deurganckdok and Schipluiden may also be placed within this context. An early German example is formed by Hüde I in Niedersachsen (Deichmüller 1969).

From a distinct theoretical perspective developments have been more limited. Van de Velde (1979) for instance focused on the social aspects of the LBK. Verhart (2000) studied the transition to agriculture in the light of contact and exchange between foragers and farmers and Raemaekers (1999) used cultural transmission as a means to study the rate of the process of Neolithisation. Recently, Louwe Kooijmans (2009) introduced the idea of 'agency' in relation to an analysis of Hazendonk sites in the Delfland region. Overall these approaches have been intent on arriving at distinct models for defining society and as such have also remained distinctly functional.

Limited change

It may be concluded that, in contrast to developments in British, Irish and Scandinavian archaeology, the basic outline of Meso- and Neolithic research in the LRA remained relatively constant. Several traditions, each with their own emphases, might be defined. This may lead to problems of comparability, but these are mostly of a practical nature. For instance, a meticulously documented Mesolithic flint scatter is not readily comparable to a Mesolithic site where most analytical attention has been devoted to studying the contents of hearthpits. In this respect one of the major changes of the last few years may prove to be the introduction of commercial archaeology. This has on the one hand led to a different work-ethos which is often more inclined towards purely recording due to constraints of time and money. On the other hand it (albeit incidentally) enabled excavations of a previously unknown scale and importance. The impact of recent excavations of sites such as Hardinxveld-Giessendam Polderweg and De Bruin, Schipluiden, Ypenburg and Hoge Vaart on the existing body of knowledge for that specific period is indicative of the large differences in quality and potential existing in the available dataset. This raises the need for an assessment of these differences as well as of the limits of comparability between high and low quality sites.

4.4.3 General emphases in excavation practice

A major impact on the way in which sites are excavated, apart from issues of time and funding, is the specific interplay between the nature of the archaeological remains and the regional and local geological and geomorphological situation. An important result of this is the fact that we use different scopes to study the past in different areas. This can be demonstrated by a topical discussion of a number of aspects.

Scale

For instance, many upland Mesolithic locations have been studied through small-scale excavation, focusing on the concentrations of artefacts (Crombé *et al.* 1999). In contrast upland Neolithic sites are usually excavated more extensively because of the assumed potential for finding features and structures and, often, the less distinct spatial information present at the surface. Wetland excavations are again often limited in size due to the financial and technical restrictions in excavating waterlogged sites. Also the limited surface of the inhabited elevation, for instance a levee or a river dune may form a factor in this.

It should be noted that these differences are not absolute. The excavation of a wetland site on a coastal barrier, such as for instance Schipluiden or Ypenburg, is, to some extent, more comparable to an upland Neolithic excavation than to, for instance, more distinct wetland sites and excavations, such as those at Hardinxveld or at Swifterbant-S3. While there is thus a coarse-grained distinction in the scale of excavation between Mesolithic and Neolithic upland sites and between upland and wetland sites, it is important to remark that the physical extent of the excavations and the level of detail is significantly influenced by constraints of time and money and technological possibilities. Recent commercial excavations such as those at Hardinxveld, Hoge Vaart, Schipluiden and Ypenburg, under the flag of large-scale infra-structural works (see Appendix I) in this respect are at the positive end of a diverse spectrum. Next to this factor the (expected) characteristics of archaeology from a certain period or analogous site and specific research questions also shape the characteristics of excavation.

Finds and/or features?

Apart from scale there are also other differences in field methodology, often related to the type of archaeology that one may expect to encounter. As argued above, many excavations of Mesolithic upland sites are aimed at recording artefact distributions (see Weelde-Paardsdrank or Brecht-Moordenaarsven in Appendix I), while features form a prominent research aim at upland Neolithic sites (see Veldhoven-Habraken, Appendix I). At wetland sites, both features and finds are often preserved and may be recorded. These contrasts relate to whether previous patterning in finds was present or whether features were there initially, as well as to the extent that both have been preserved. For instance, apart from hearths certain other features may not be expected or preserved at upland Mesolithic sites, and, as at Mariënberg, pattering in finds may be absent altogether. In other situations features may be extremely difficult to discover, as at many Middle Neolithic sites on the sand and loess. Decisions are therefore made based on the assumed presence, or absence for that matter, of features and patterning in finds, which means that different emphases exist in excavation strategies.

4.4.4 Methodological characteristics of upland and wetland excavations

Apart from the more general contrasts discussed above a number of additional aspects may be mentioned. In the following, a number of differences between methodological approaches of sites will be discussed for Mesolithic and Neolithic upland sites and for wetland locations. While these are not exhaustive, they serve to illustrate the differences in datasets we are dealing with and the different emphases that exist in methodological approaches (see also Peeters *et al.* 2002).

4.4.4.1 Artefacts

Because of the characteristics of preservation at sites, in combination with period-specific artefact categories (*i.e.* absence of pottery at Mesolithic sites, however see Amkreutz *et al.* 2010), sites have been excavated with different emphases in recording and analyses. In general, research at most Mesolithic upland sites has been aimed at typo-technological analysis and spatial distribution. Both are affected by the palimpsest effect due to recurrent (yet varying) use at different times, the absence of a cover and post-depositional processes. The value of a definition of certain subgroups, as for instance has been done by the Leuven school (*e.g. Groupe du Moordenaarsven*, *Groupe du Paardsdrank or Groupe du Ruiterskuil*), is therefore of limited chronological or functional value (see also Vermeersch 1984, 186-193). Similarly, many techniques that were employed in the 1970s and 1980s to deal with spatial patterning (*e.g.* Newell 1984; Price *et al.* 1974; 1978; Huiskes 1988; Whallon 1973; 1974; 1978) proved incapable of countering the palimpsest effects (see Binford 1987a, 502-508; Hodder/Orton 1976, 239; Newell 1987). The usefulness of, for instance, 3D-recording as was initially done at sites such as Bergumermeer, Weelde or the Hazendonk (see Appendix I; Huyge/Vermeersch 1982) is currently being questioned due to the many occupation events that took place at these sites and their long exposure to post-depositional processes. For the well-preserved Federmesser site of Rekem, the excavators argued: '*Although they may have some heuristic value, and can certainly be used for testing hypotheses, we have the overall impression that many of these procedures are no match for the complex processes involved in artefact distribution and they generally fail to contribute to the ultimate interpretation of the layout*' (De Bie/Caspar 2000, 29). The regular use these days of applied archaeological cartographic software is also more geared towards enhancing the visual and thematic interpretation of sites. It therefore appears that the erstwhile popular procedures involving intensive three-dimensional recording and complex statistical analysis have become obsolete for most of the studied sites in the LRA. The complex nature of syn- and postdepositional processes and the differences among these are much better controlled by a flexible and contextual perspective that correlates the precision of the excavation technique with the level of taphonomic disturbance.

At Neolithic upland sites the distribution of finds, even in the plough soil, has recently received increased attention, because of the possibilities of correlation with visible or expected features below (Rensink *et al.* 2006).[5] Overall, for the sites studied some patterning in upland finds may be witnessed, but this seems related to a significant degree to the exposure time before a cover formed. The spatial patterning in finds at a site such as Sint-Odiliënberg-Neliske is inferior to that at sites that were covered shortly following occupation, such as for instance Gassel or Schipluiden (see Appendix I).

Specific preservation

Another aspect related to this is the degree to which certain artefact categories have been preserved. A first example is formed by pottery. Apart from some Mesolithic sites with questionable association pottery does occur at Neolithic upland sites, but only to a limited extent. In contrast to, for example, the preservation environment in LBK pits, pottery at Neolithic upland sites seems to have suffered intensively from post-depositional processes and exposure to the elements. Its survival is dependent on baking temperature, clay and temper used and the acidity of the soil in which the sherds have become embedded (Groenewoudt 1994, 113; Raemaekers 2005[b], 16). This poses a distinct problem for the identification of (the nature of) sites and their cultural attribution in upland environments. Examples included Middle Neolithic flint scatters or the question to what extent Swifterbant and Hazendonk sites occur on the Pleistocene sandy soils (*e.g.* Amkreutz/Verhart 2006; Niekus 2009; Raemaekers 1999, 123; Raemaekers 2005[a], 262; Vanmontfort 2004, 313).

Apart from lithic and ceramic finds, organic artefacts are virtually absent in the upland areas. This forms a strong contrast to wetland sites where, for both the Mesolithic and Neolithic periods, organic remains, including artefacts, provide a wealth of information (Coles/Coles 1989; Louwe Kooijmans 1993[a], 73). Since this forms a problem for comparing sites, other categories such as site size, feature type and lithic assemblage provide a means for analysis of similarities in use and function (see also Chapter 5). Evidently the differences in preservation have also influenced excavation and sampling choices as well as analytical techniques.

4.4.4.2 Features

Concerning features, Mesolithic upland sites are characterised by surface hearths and hearthpits (see for instance Mariënberg, Weelde, or Opglabbeek in Appendix I). Finds from these features are often limited to (some) calcined bone, charcoal and charred botanical remains. For the category of hearthpits research points to their use as specific facilities for low combustion burning, perhaps in the preparation of food or tools (Niekus 2006; Perry 1999). Other features are rarely recorded (for an exception see Mariënburg, Louwe Kooijmans 2012[b]; Verlinde/Newell 2006) and are sometimes interpreted as 'ghost-structures' based on the artefact distribution. At the sites of Weelde and Meeuwen-In den Damp, for instance, the presence of huts, or tents and activity areas is inferred by the patterning in lithic remains (see Appendix I; Huyge/Vermeersch 1982; see also Stapert 1992). The supposed hut features recorded at Bergumermeer-S64B are no longer tenable as such (Niekus 2012). The absence of many structural features for Mesolithic upland sites may very well reflect the limited investment in built environment by these mobile groups.

Absence of evidence?

For Neolithic upland sites the overall absence of features, except for the Early Neolithic LBK, poses a problem in the recognition and interpretation of sites. A good example is formed by the sparse information available for MK and SWV settlements in the study area. most of these sites consist of scatters of flint of variable extent, some pottery and often no or very few features (*e.g.* Louwe Kooijmans 1998[a], 413; Schreurs 2005, 309-310; Vanmontfort 2004, 313). Only in some cases are house plans discovered, such as recently at the Stein-culture site of Veldhoven-Habraken (Van Kampen/Van den Brink 2013/in prep.) Their virtual absence on the sandy soils can be explained in several ways. From a behavioural perspective it might be indicative of a rather ephemeral settlement system, marked by light structures and a frequent displacement of houses to new locations. Evidence for a partially comparable system is available from Southern Scandinavia, Britain and Ireland (*e.g.* Barclay 1996; Sheridan 2013; Smyth 2006). The often-solitary occurrence of features furthermore led to the assumption of single house sites, which were regularly rebuilt elsewhere as the soil was depleted (see Cauwe *et al.* 2001; Verhart 2000, 219). We thus may overestimate the visibility of the initial material reflection of this type of settlement system. The elaborate houses from Veldhoven, however, seem to argue against this (although they, of course, need not be emblematic for Neolithic upland occupation). The absence of decent faunal spectra for upland Neolithic sites, or evident indications for crop cultivation unfortunately means no further light can be thrown on issues of site duration and permanence.

There is on the other hand also evidence of severe taphonomic disturbance of features dating to this period (*e.g.* Burnez-Lanotte *et al.* 1996; Groenewoudt 1994; Vanmontfort 2004; see also below). Groenewoudt (1994, 113) mentions the disturbing effects of bioturbation and soil formation processes leading to the gradual disappearance of features, especially on well-drained sandy soils. Features have often disappeared or are only visible on a lower level and thus easily missed (see table 4.6). To some extent this is less the case with features at, for instance LBK, or Late Neolithic sites, at least on the loess. These seem to have been dug

Site	Nfeatures	N preh. features/Neolithic	N Neolithic structures
Gassel	?	-	-
Grave-Pater Berthierstraat	10	3/1	-
Helden-Panningen Industrieterrein	>318	318/3	-
Ittervoort-Santfort	>300	*c.* 100/3	-
Kesseleik-Keuperheide	>4	4/1	-
Koningsbosch	-	-	-
Linden-de Geest	57	16/1	-
Linden-Kraaienberg	45	45/3	-
Meeuwen-Donderslagheide	-	-	-
St-Odiliënberg-Neliske	42	17/2	1?
Sweikhuizen	-	-	-

Table 4.6 Indication of the presence and visibility of Neolithic features on the upland sandy soils. The second column indicates the number of prehistoric features and positively identified Neolithic features on the basis of their contents (see Appendix I for further details).

before and after the period of soil formation respectively (pers. comm. J.W. de Kort 2012; see also Rensink *et al.* 2006; St.-Odiliënberg-Neliske in Appendix I).[6]

Finally, we might be looking for these structures in the wrong manner. By opening long and narrow commercial test trenches, Neolithic house sites, possibly consisting of dispersed functionally distinct areas, might easily slip through the established mesh as was demonstrated for the site of Stora Herrestand in Sweden (Rowley-Conwy 2004, 93-94).

At wetland sites features are in general reasonably well-preserved, due to (often relatively) quick sedimentation rates. As demonstrated at sites such as Hardinxveld, Schipluiden, Ypenburg and Hoge Vaart, this offers the opportunity of combining information from finds and features, which affords a better handle on occupation dynamics. A good example is formed by the clustering of finds at Schipluiden (see Wansleeben/Louwe Kooijmans 2006) and the information this yielded on the habitation areas defined by clusters of posts.

4.4.4.3 Chronology and dating

Apart from feature- and find-related contrasts between upland and wetland locations, both also offer a different potential for sampling. With respect to absolute and relative dating and chronology of sites, the differences are marked. Upland sites suffer from a limited amount of material suitable for radiocarbon dating. Furthermore, especially charcoal has often been contaminated, or suffers from the old-wood effect and problems may arise in the pre-treatment of samples (Crombé *et al.* 1999; 2012; Lanting/Van der Plicht 1999/2000, 4-5; Van Strydonck *et al.* 1995; Waterbolk 1971). Short-lived samples such as hazelnut shells may yield better results. Nevertheless, one of the major issues at these locations is the question of association of samples and the phenomenon that is to be dated (Waterbolk 1971, 15-16). Van Strydonck *et al.* (1995, 291; see also Crombé *et al.* 2012) mention the fact that especially archaeological sites on the sandy soils suffer from the dislocation of artefacts and datable material. The main reason is the lack of an adequate and swift covering of previous habitation surfaces. The long-term stability of the landscape therefore leads to contamination due to syn- and postdepositional processes. Verhart (2000, 213), for instance, mentions the intrusiveness of material from other levels. Another important aspect is the general absence of pit fills at upland sites as argued above. Based on these characteristics Van Strydonck *et al.* (1995, 296) have therefore opted to abandon the classic relationship between dates, stratigraphy and artefacts in some cases and to treat the available ^{14}C dates as a group within which clusters can be defined.

For wetland sites one of the problems is formed by the reservoir effect, which causes ^{14}C samples of animal and human bone as well as food remains (residue on pottery etc.) to be dated as much as several hundreds of years older than expected.[7] Samples from several species of water plants are also unreliable because of their uptake of water with an ancient signature (hard water effect).[8] In general, however, wetland sites offer a range of benefits for dating and establishing site-chronology. With respect to absolute dating the organic material and its association to the archaeological finds or features that are to be dated is often far less ambiguous. Apart from that, the (potential) cover by peat or clay in subsequent phases of sedimentation offers a 'partitioning' of the site in stratigraphical layers (see also above). The relative periodization of these sites therefore offers a better framework for dating phases and events. It may therefore be concluded that the degree of spatio-temporal and general chronological control is appreciably greater at wetland sites.

4.4.4.4 Subsistence, seasonality and ecology

Although self-evident some remarks may be made regarding the information available for reconstructing subsistence, seasonality and ecology. Regarding all three topics the potential degree of information available from wetland sites is considerably larger when compared to upland locations (see wetland sites in Appendix I). This mainly relates to the fact that a much wider array of organic remains, informative on subsistence and the wider environment is preserved at these sites, whereas most organic information on upland sites has to be derived from charred botanical remains or calcined fragments of bone. These offer a much smaller and distorted sample that is also filtered by the necessity of fire for preservation and therefore (often) only represents a hearth-related sample. A good example is provided by the wealth of organic information available for the wetland Mesolithic sites of Polderweg and De Bruin (Louwe Kooijmans 2003), in comparison to for instance the botanical information from hearthpit sites such as NP-3 (Perry 2002) or the faunal remains preserved at Weelde-Paardsdrank (Huyge/Vermeersch 1982). With respect to environmental reconstruction pollen forms a category of information that may be present in both upland and wetland contexts, although it should be noted that problems of association or intrusion occur more frequently and intensely at upland sites (*e.g.* Vermeersch *et al.* 1992).

While it is easy to caricaturize the distinct contrasts that exist in this respect between upland and wetland sites, this is not helpful. Yet, it should be stressed that we are dealing with very different datasets that are hard to compare and that make inferences about subsistence, site location choice and seasonality or mobility in different landscape zones difficult. It therefore remains necessary to integrate organic data, or the absence thereof, with artefact categories or other aspects, such as site location choice, features and sources of information such as pollen etc. that are intercomparable and that may offer a better understanding of the similarities and differences in behaviour in different (upland and wetland) areas (see also Chapter 5).

Something that redresses the (dis)balance in information a little is the fact that the wider palaeolandscape in the wetlands can only be established by augering and removing covers, while on the uplands it is to a large extent visible at the surface. Differences do of course arise once again when attempting to reconstruct vegetation and fauna, for which upland locations offer fewer and more limited opportunities.

Problems in sampling and analysis

While the quantitative and qualitative balance in available sources of (organic) information clearly lies with sites in the wetland spectrum, this does not mean that the information deriving from them is necessarily straightforward. Especially with respect to faunal and botanical remains, many problems and pitfalls can be encountered when trying to establish an idea of subsistence, seasonality or ecology (see also Rowley-Conwy 2004). Without attempting to be exhaustive a number of these may be briefly mentioned.

For botanical remains this for instance involves differences in the degree to which certain species will be preserved (for instance hazelnuts), due to their physical qualities or preparation in cooking etc. With respect to agriculture there is a difference in the importance of specific sources of information. Palynological information may shed light on threshing or cultivation activities (*Cerealia* and *Landnam* pollen), or the presence of open spaces. Ard or hoe marks may point to crop cultivation, as does sickle gloss on lithic instruments or, potentially, the presence of long straws among the botanical remains. Grinding stones again only point to consumption, while macro-remains of cereals may point both to consumption and preparation (threshing or winnowing in the case of chaff and consumption in the case of cereals). Non-local weeds may indicate where cereals were grown and whether they were imported (*e.g. Bromus secalinus*). Arguably it is the combination of these indicators in relation to quantitative issues and site location choice that may shed light on, for instance, the question of local cultivation versus the import of cereals (see also Bakels 1986; Cappers/Raemaekers 2008; Out 2009; Rowley-Conwy 2004).

Similar considerations apply to faunal remains. For instance, regarding the differential preservation of bones (*e.g.* autolysis in fish bones, and the predominance of bony sturgeon plates, or the superior preservation of longbones in mammals compared to other skeletal elements etc.). Related to this is the number of identifications compared to the number of counts (*e.g.* Van Neer *et al.* 2005, 282), the elements that are taken to the sites and the interpretational differences between the number of bones, the bone weight and the caloric or meat value attached to these. This is especially poignant when attempting to compare the subsistence contribution of diverging categories such as fish, birds and terrestrial animals. Another aspect is formed by the presence of background fauna (and flora) that should be filtered out (see also Beerenhout 2001; Binford 1981[b]; Zeiler 1997).

A different topic involves the difficulties that arise in metric distinction between wild boar and pig and aurochs and cattle and the validity of distinguishing a combined category of pig and wild boar (as was for instance done at P14, see Gehasse 1995, 5; see also Albarella *et al.* 2007; Rowley-Conwy *et al.* 2012). It should be realised what consequences this has for identifying the (economical) stage of Neolithisation based on faunal counts, as is for instance done in the availability model (see Zvelebil/Rowley-Conwy 1984; Zvelebil 1986[a]; Raemaekers 1999). Of a different nature, but also important are the specific questions addressed to the faunal samples. Was the aim to arrive at a purely biological count, or were more behavioural questions such as subsistence, environment, seasonality and hunting strategies taken into account?

These considerations indicate that many factors and filters impose themselves on our interpretation of botanical and faunal information, for answering questions of subsistence, seasonality and land-use. Although wetland sites may be regarded as qualitatively superior in preservation, and thus also in terms of information regarding many of these issues, the actual value of the information depends on the manner in which it was analysed and the degree to which various filters were dealt with. It is therefore important to note that while there may be a specific physical distinction in the information sources available resulting in our dealing with different types of datasets, there are furthermore distinct methodological differences in the way these different datasets were recovered, sampled and analysed and in the specific problems these differences yield.[9] One of the major factors again is the degree to which time and funding was available for and allocated to tackling these issues.

4.4.4.5 Implications for establishing site-function

Taking into account the considerations above, it becomes apparent that there are considerable differences in the (types of) data available at wetland and upland sites that result in a number of different methodological emphases in excavating and analysing information from these locations. As argued earlier it is therefore difficult to compare sites located in these different environments. Nevertheless, by focusing on other categories of information, such as for instance pottery or lithic remains (artefact spectrum, number of finds, distribution, raw material sources, use-wear), features, site locations choice etc., certain similarities and differences in site-use and site function may be recognized (see Chapter 5).

With respect to the position of sites in the process of Neolithisation in particular, it may be argued that the identification and quantification of cultigens and domesticates often pose problems of their own. The relative contribution of these novelties both to the diet as well as in daily life are, however, more important than their presence or absence (see also Chapter 3 and Chapters 7-8). To some extent, the often-encountered (taphonomic) difficulties with establishing the relative contribution of specific categories of food to the diet might partially be resolved or complemented by isotope analysis (*e.g.* Smits *et al.* 2010). Finally, it is important to be aware of the fact that while botanical and faunal indicators potentially provide an idea of the stage within the transition to agriculture, or in terms of Zvelebil (1986[a]), availability, substitution and consolidation, this does not directly translate into how (new) resources were dealt with, or to what extent a process of Neolithisation progressed. This will be further touched upon in Chapter 7.

4.4.5 A note on the limits and delimitation of sites

Apart from the general methodological considerations discussed above, the different geological situation and associated site formation processes in uplands and wetlands also influence the extent of sites that may be documented (*cf. supra*). Furthermore, it presents different opportunities and problems with respect to the delimitation of the site itself, its perimeter and the wider region.

With respect to site extent, a brief review of the sites in Appendix I indicates that the majority has not been excavated completely and that, except at some locations where augering or testpitting took place, the overall extent of the site is not known. It appears that site extents are somewhat better established for wetland sites, which of course predominantly relates to a more limited palimpsest effect and the preservation of intact occupation layers that may be delimited (*e.g.* Louwe Kooijmans/Verbruggen 2011), in combination with, for example, the physical extent of a river dune or levee.

Behavioural limits

Apart from site-formative issues it is also difficult to establish the delimitation of sites from a behavioural perspective. In the case of Mesolithic flint scatters, such as those at Brecht-Moordenaarsven (Vermeersch *et al.* 1992), refit analysis may attest to the contemporaneity of certain clusters or concentrations at a site, although it cannot be excluded that what is actually documented is the re-use of material that was discovered at a later moment after a cluster came into existence. Of course the blurring of patterns in this respect increases when sites have been subject to more intense spatio-temporal collapse and re-use of locations (Binford 1982; Conkey 1987). The same problems are to be found at wetland sites. For instance the supposed 'twin-site' relationship between Hardinxveld-Polderweg and De Bruin (see Louwe Kooijmans 2003) is a plausible educated guess, but hard to prove conclusively. In line with this, the occurrence of archaeological indicators next to well-excavated sites such as Bergschenhoek, Schipluiden, Hoge Vaart and Bergumermeer (see Appendix I) may perhaps not cast doubts upon the degree to which the core of these locations has been documented, but does raise the question to what extent it relates to similar, subordinate, or perhaps in the case of Bergschenhoek, larger activity areas in the vicinity.

As was already mentioned earlier, resource issues of time and money importantly influence the extent of what is known, as well as the difficulties that arise technically, as is for instance demonstrated by the relatively limited excavations at wetland sites, in relation to estimated site sizes (see table 4.7).

On the other hand specific research traditions may be an influence here as well. Crombé *et al.* (1999) for instance argue that the absence of hearthpits at most of the Belgian Mesolithic sites might be due to the limited area that is usually excavated. Such considerations are especially telling when it is realized that intersite refits and raw material from, in this case, the Early Mesolithic sites at Weelde-Voorheide, indicates that functional relations may exist between clusters located at a considerable distance from each other (possibly up to 300 m; Verbeek 1996).

Site	Extent excavation m²	Est. extent site m²	References
Hdx-Polderweg layer 1	448	4000	Hamburg/Louwe Kooijmans 2001
Hdx-Polderweg layer 2	448	1600	Hamburg/Louwe Kooijmans 2001
Hdx-De Bruin layer 1	345	1200	Nokkert/Louwe Kooijmans 2001
Hdx-De Bruin layer 2	345	1200	Nokkert/Louwe Kooijmans 2001
Swifterbant S3/5/6	400	600-760	De Roever 2004/Van der Waals 1977
Swifterbant S2	451	750	Raemaekers *et al.* 2005; De Roever 2004
Brandwijk L30	29	200 + top	Raemaekers 1999
Brandwijk L50	29	1500 + top	Raemaekers 1999
Brandwijk L60	29	1600 + top	Raemaekers 1999
Hazendonk Haz-1	±342	800	Raemaekers 1999; Verbruggen 1992[b]
Hazendonk Haz-2	±342	300	Raemaekers 1999; Verbruggen 1992[b]
Hazendonk Haz-3	±342	730	Raemaekers 1999; Verbruggen 1992[b]
Hazendonk-VL1b	±342	760	Raemaekers 1999; Verbruggen 1992[b]

Table 4.7 Excavated and estimated site surface of several wetland sites. Note that often only small samples have been excavated.

Nevertheless, as is demonstrated by excavations such as those at Hardinxveld, or from a different perspective Hoge Vaart, the limited sample of a high resolution excavation, or a part of it, may within certain limits be considered representative for the entire site (*e.g.* Louwe Kooijmans 2001[a]; Peeters 2007).

From site to region

On a related but larger scale the level of information on sites and settlement systems in the region is also dependent on local geomorphological circumstances and site formation processes. In general it may be postulated that upland sites are more easily detectable, since they are at or near the surface and may be documented by fieldwalking etc. Wetland sites on the other hand are often not visible at the surface. This means that they are only discovered by methods such as augering, or for instance construction work. Specifically telling in this respect is the quick increase in number of sites and information on the Swifterbant, Hazendonk group and Vlaardingen culture occupation of the Delfland area and the region around Rotterdam over the past decade (see Appendix I; Koot *et al.* 2008; Louwe Kooijmans 2006[a]; Meirsman/Moree 2005). This points to the fact that these days, despite the limited scope for surface surveys, wetland areas offer indirect opportunities to conduct regional research. Similar work has been conducted directly in the Alblasserwaard region by an extensive augering programme conducted by the Faculty of Archaeology (Leiden University; see Louwe Kooijmans/Verbruggen 2011; Verbruggen 1992[b]; Verbruggen in prep.), documenting the Mesolithic and Neolithic occupation of the donken area. Recently (Louwe Kooijmans 2009) it has been demonstrated for the Hazendonk occupation of the Delfland region that these regional perspectives throw an interesting light on the diversity within the settlement system and the behavioural choices made by contemporaneous communities (see also Chapter 6).

A cautionary note is called for as we have still only documented part of the potential of occupation locations that may have been present. For the area around Schipluiden an estimate was made of the total surface of (inhabitable) dunes in the area. This was based on the augering data gathered at Schipluiden (see Mol

2006, fig. 14.7). By measuring the total dune surface mapped by augering and its contribution to the overall area documented, an estimate of 12% was established, incorporating a certain correlation for less intensively investigated zones (*cf.* Mol 2006, 282; see fig. 4.12). Subsequently this number was extrapolated for the entire back-barrier area. This procedure is of course complex since the extents of the area documented and calculated are flexible, but it can serve as a rough estimate. For the coastal back-barrier area, measuring approximately 34 km^2, the total surface area of potentially inhabitable locations amounts to 4.1 km^2. Yet, only a total of approximately 10.000 m^2 (1 ha) has been archaeologically excavated, although a number of locations were investigated by augering etc. Overall it can, however, be suggested that approximately 0.25% of the inhabitable area has been investigated. Another example is formed by the Swifterbant area where only a mere 2% of the potential site surface has been excavated (see Devriendt 2013; Raemaekers 2006). Of course only a small percentage of the inhabitable area was actually used, but this serves to demonstrate how much *terra incognita* remains. In our interpretation of past settlement systems and site functions we should be aware of what we do not (yet) know and, regarding-the upland-wetland distinction discussed earlier, deal with the quantitative benefits and methodological limitations of the former, versus the qualitative character and spatio-temporal opportunities afforded by the latter.

4.4.6 Retaining a site approach?

The foregoing paragraphs have discussed various methodological repercussions of dealing with sites in different (upland and wetland) contexts. It should be apparent that sites in different geological and site-formative environments offer different opportunities and constraints for establishing site function and site delimitation (identification of what belongs to the site proper, to the site perimeter and to its direct surroundings (see also Bakels 1978)). Furthermore, the potential for regional and landscape-oriented investigations differs. In the past, especially some of the constraints of identifying sites have led to approaches that advocate a regional or landscape perspective on archaeological information instead of a site approach. This has contributed significantly to our understanding of settlement systems and landscape use, but it is argued here that the site should not be abandoned as a conceptual framework in archaeology.

Site criticism

Underlying a regional or landscape approach is the idea that, although in many archaeological studies the site is often the basic (spatial) unit of analysis, its value as a heuristic device is questionable. Foley (1981, 157) argues that the archaeological record is not punctuated but spatially continuous. Within the overall dispersion of artefacts localized densities occur, or, according to Isaac, patches within a scatter (1981, 136). We usually refer to these concentrations as sites, but they come into existence for different reasons related to various syn- and postdepositional events. In this respect Dunnell (1992, 26-29) refers to them as accretionary phenomena. According to Dunnell sites are often perceived as things that can be observed, rather than units that are constructed by observation at a particular point in time (*ibid.* 26). While the contemporary nature of the archaeological record is generally accepted, Dunnell proceeds from this point and argues that sites should therefore not be used as units of observation, association, counting and interpretation.[10]

For the Mesolithic and Neolithic of the LRA Peeters (2007, 23-27) documents similar problems regarding the delimitation of Stone Age sites. Should the distribution of lithic remains be documented, or perhaps that of bone or charcoal? Drawing on the arguments put forward by Foley (1981) and Dunnell (1992), Peeters opts to abandon the site concept in favour of a landscape approach. According to him the site-approach is an actualistic approach by which inferences are drawn with regard to settlement systems as an expression of landscape use. His criticism is levelled at the idea that the evidence for dimensions of land-use is not restricted to points and that in this way many aspects of behaviour are not studied (*ibid.* 25). This, however, seems a semantic discussion. Binford (1992, 50-51), for example, defines sites as '*conceptual generalizations about the spatial distribution of artifacts*' but he also stresses the importance of '*scalar variability, which is differentially accessible in the landscape*' and responsible for the variability in patterning. While Binford emphasises scale, Peeters (2007, 26) argues it is not about scale.

The notion site is understood to be problematic. Much more than spatially and chronologically integrated *loci* of functionally coherent artefacts and features, they (archaeologically) are the material amalgamations of (mainly) disposal and abandonment activities. Moreover, the occurrence and specific constellation of these static and mobile phenomena at locations referred to as sites, is to be imputed to a considerable variety of factors, including anthropogenic behaviour as well as natural processes. Peeters (2007, 26) argues that there are many activities with little or no archaeological output (for instance a discarded scraper or a palynological signal) that are of equal importance. Arguing whether or not they are 'covered' by a site approach is, however, strongly dependent on what one defines as such. From an analytical perspective the concept of site is indeed insufficient since it is only a clustering of archaeologically detectable, material manifestations of the archaeological record. On the other hand one might wonder to what extent the informative value of archaeological data *not* covered by the concept of site *sensu lato*, can be contextualized, characterized and attributed to the archaeological and cultural object of investigation (*e.g.* Jeunesse 2003). From an interpretative viewpoint, however, the concept of site is very much an ontological categorization. It has value for the contemporary archaeologist working at a site or with the information excavated or documented. It has documented or inferred boundaries and the information acquired serves as a contrast or comparison to other sites or isolated finds and patterning. Whether or not in concordance with this contemporary perspective, sites in a past reality would have been equally relevant as the locations of some form of past human activity of singular, repetitive or interspersed nature. Sites in this sense might have had no specific meaning to 'occupants' in the past, but may also have been a form of niche construction (*e.g.* a bountiful hunting location), a field or fishing weir, a home or a sacred place.

Dealing with sites

It seems that abandoning the site-concept is unnecessary. Considering the archaeological record from a different scale such as a landscape or artefact approach might lead to new insights and is therefore recommendable. However, the essential problem, explaining the observed patterning and finding methodological means to do so, remains the same (*cf.* Binford 1992, 55). Apart from this, abandoning sites as units of *interpretation* overlooks the fact that they are meaningful on two different levels. First of all sites, apart from being distorted accretionary phenomena, do have an intrinsic functional value. With appropriate techniques most sites, to some extent, can spatially or stratigraphically be broken down into chronologically and/or functionally autonomous or related components. Apart from an adequate cover this is mainly dependent on the level of redundancy and whether or not activities were more or less spatially bound (see also Sommer 1991). The presence and re-occurrence of built environment and activities at a certain place are thus purposeful and provide meaningful insight into past societies. Secondly, from an *emic* perspective the site concept is of value since it provides the means to translate *space* into *place*. Whereas the former is a physical concept, the latter is meaningfully constituted and of actual (albeit variable) significance to past societies (see also Casey 1996; Ingold 2000; Feld/Basso 1996; Jones 2007; Verhoeven 1999). The sites studied here were often ordered and structured by their initial users. They often formed fixed points in daily routines and seasonal or annual cycles of mobility. There is ample evidence of the development of certain locations into 'persistent places' that witnessed repeated occupation and use over many decades and even centuries (*e.g.* Barton *et al.* 1995; Schlanger 1992). Even if they only represent isolated singular activities, their location and structuring will usually have been more than purely coincidental. Abandoning the site-concept is thus also partly abandoning a search for classification. For these reasons it is valuable to retain the site concept and wield it as a basic unit of analysis and interpretation as is done in this study. Sites and especially excavated sites thus remain the archaeologist's bread and butter as was stated by Binford (2002, 109).[11] However, for a better understanding of the dynamics of past systems, especially within a coherent regional context, it is obvious that an integrated approach incorporating landscape and artefact perspectives is both necessary and of great value. Sites remain in need of contextualization.

4.4.7 Current Dutch situation

The overview above has singled out several common methodological problems ranging from perspectives regarding the implications of Neolithic and Mesolithic, through sampling procedure, to the role of sites and the limits of our interpretations. As has been argued, issues of time, money and resources have often formed and still form a crucial factor regarding the quality and quantity of the information that is excavated. Over the past two decades much has changed in the archaeological field in the Netherlands. The most important development was the introduction of a commercial market for excavation next to the research conducted by universities and the Cultural Heritage Agency of the Netherlands (RCE).

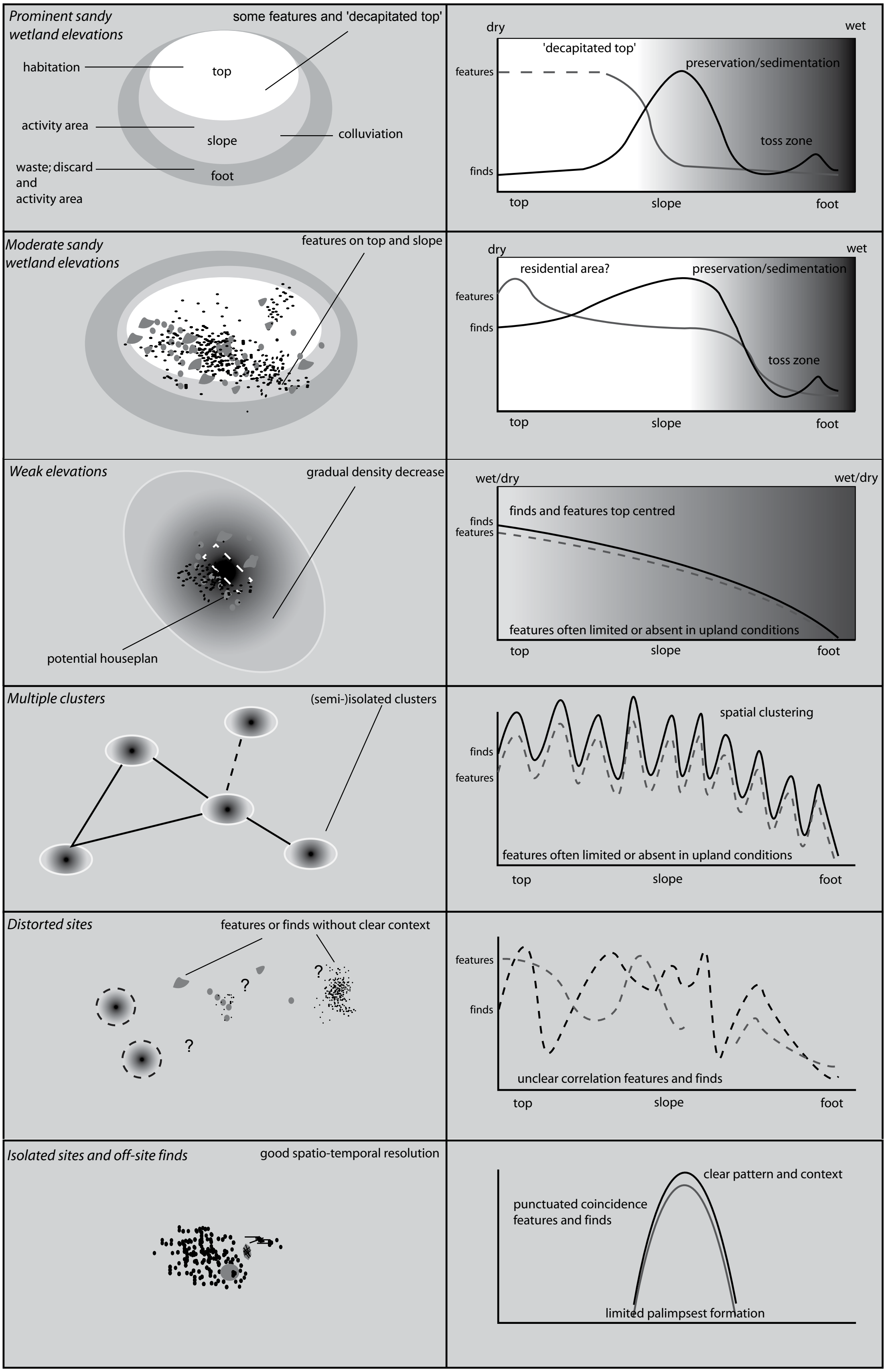
Because of the implementation of the Treaty of Valetta in Dutch law (the 'Malta law') we are currently faced with an archaeology predominantly characterized by cultural resource management, commercially operating companies, building plans, time schedules and often strictly limited budgets. This has on the one hand opened previously closed doors, enabling intensive and expensive excavations such as performed at Hardinxveld, Schipluiden and Hoge Vaart, although one may debate to what extent these large-scale projects are representative of the average research conducted. On the other hand Malta archaeology also limits the (academic) freedom of deciding which direction new research should take and, for instance, what new quintessences should be defined in studying the process of Neolithisation. Hodder (1999, 31) argues that '*…in recent decades it often seems as if the recording process has come to determine the digging process*' as well as that '*…as recording systems have become more formalized, excavation often seems to proceed as if the ground was being looked at through the recording system. Rather than the recording system serving the interests of knowledge acquisition, the relationship is inversed and we dig in order to record.*' The limited manoeuvring space within commercial archaeology for surpassing the level of basic documentation and reporting in favour of investing in interpretation, as well as the restrictions with regard to where and how to excavate, might, in time, result in our looking through a 'Malta-filter'. Although this may be too bleak a picture, two general conclusions might be drawn from the methodological analysis above. The first one is the need for sites to be excavated completely. Much more information can be gained from integrally excavating qualitatively potential sites, than having an elaborate collection of much less informative 'postage stamps'. While in many cases this will not be possible, it is necessary to invest in contextualization. This might involve as widely diverse activities as augering or surveying for site extents, sampling nearby wet locations to establish the impact of a site on the landscape, or studying grey literature to better place a site within its regional context. This indicates that the means available are ideally distributed according to what is academically most interesting leading to an informative balance between 'parts' and 'wholes'. Therefore a constant dialogue between commercial archaeology and the academic field is very important as well as a consistent update and discussion of documents such as the NOaA.[12,13]

A second conclusion can be linked to the previous one and involves the benefits of a non-dogmatic approach in fieldwork and subsequent analysis. Since every excavation will be different because its subject matter is unique and the procedure of knowledge acquirement is not replicable, the field is not availed by rigid standard procedures. A certain level of flexibility and freedom is required to maximize the potential of information available. Another term would be 'fluidity' (*cf.* Hodder 1999, 93) in research procedures. It is felt here that the future of (Stone Age) archaeology would ideally benefit from a commercial focus on the contextualization and embedding of the information that it excavates as well as a commercial practice with enough elbow room to shift emphases 'along the way' from a methodological and interpretative perspective.

4.5 An archaeological site typology

The previous sections have demonstrated how sites in the LRA are affected by various behavioural and taphonomic syn- and postdepositional processes and that their interpretation is strongly dependent on the scope for and approach chosen in methodology. While these factors of course differ per site and context the combined overview of sites that have been documented for the period and region studied allows for a categorization mainly based on non-functional aspects.

In view of the landscape and regional perspectives that have arisen on archaeological patterning (De Loecker 2006; Dunnell 1992; Foley 1981; Peeters 2007) it is argued here that sites as a classificatory tool of analysis and


Prominent sandy wetland elevations
some features and 'decapitated top'
habitation
top
activity area
slope
colluviation
waste; discard and activity area
foot
dry
wet
'decapitated top'
preservation/sedimentation
features
finds
toss zone
top
slope
foot
Moderate sandy wetland elevations
features on top and slope
dry
wet
residential area?
preservation/sedimentation
features
finds
toss zone
top
slope
foot
Weak elevations
gradual density decrease
potential houseplan
wet/dry
wet/dry
finds and features top centred
finds
features
features often limited or absent in upland conditions
top
slope
foot
Multiple clusters
(semi-)isolated clusters
spatial clustering
finds
features
features often limited or absent in upland conditions
top
slope
foot
Distorted sites
features or finds without clear context
features
finds
unclear correlation features and finds
top
slope
foot
Isolated sites and off-site finds
good spatio-temporal resolution
clear pattern and context
punctuated coincidence features and finds
limited palimpsest formation

interpretation remain valuable (see Binford 1992). A distinction can be drawn, however, between the functional aspects of sites within a settlement system (*e.g.* Binford 1980; Flannery 1976) and an archaeological site typology, both based on archaeological site parameters. An example of a functional, interpretative classification is given by Peeters *et al.* (2002, table 5, pp. 110). The problem with this approach and its definition of site types in relation to resolution is that it does not incorporate taphonomic disturbance and re-use of locations. It focuses on rare pristine sites. An archaeological or descriptive typology is directly related to the various processes and alterations described above. For the sites studied here and located in the LRA, specific sets of syn- and postdepositional processes can be defined. There are also similarities in site location and there is a basic subdivision between upland and wetland locations. Since the groups of hunter-gatherers and early farmers responsible for the deposition of archaeological remains in the substrate operated in all these environments a basic site classification based on the combination of their material output and general processes of taphonomy and site formation might be useful. Based on this a number of general 'site templates' can be proposed that are based on geomorphological characteristics, in combination with specific taphonomic or spatial particularities. These should not be regarded as absolute standards or categories, since they are strongly dependent on the local situation, in relation to post-depositional taphonomic processes and human behaviour. From this perspective some sites may be assigned to more than one category. The site templates may, however, be of a general indicative value, implying that various intermediate situations exist. Below six sketches of site templates are presented (see fig. 4.12) followed by a brief description of their particularities and informative value.

4.5.1 Prominent wetland sandy elevations (river dunes)

Overall, sites located on *donken* (river dunes) are situated on relatively high and pronounced geomorphological elevations. They therefore demonstrate a prominently zoned preservation, consisting of three zones; the top (often partially preserved, see below), the slope and the foot. Dependent on the local geomorphological situation, occupation history and sedimentation processes these form the backdrop to a complex interaction between cultural and natural formation processes. The archaeological signature of these sites often indicates a discontinuous long-term use of the same location.

Finds - Most finds are found on the slope and at the foot. Several processes are responsible for this. First of all the gradient of the dune in combination with erosion of the top and sides and colluviation is responsible for a downward movement of artefacts. Concentrations of finds as for example attested at Polderweg might thus have a natural origin. Secondly the wet conditions at the foot of the dune limit the area available for habitation and activities. This might lead to a sort of barrier effect, which would be less or non-existent at upland sites. Thirdly anthropogenic structuring of the area available on the donk probably resulted in an activity area on the lower slope and at the foot of the dune. The proximity of water might have been useful for many activities while the slope higher up on the dune might have been inconvenient due to its gradient and was perhaps used as a residential area.

Fig. 4.12 Site templates depicting archaeological sites types from a post-systemic perspective.

The existence of this structuring of activities can, for instance, be found in the existence of toss and dropzones (Binford 1978[b]) as identified, for instance at the sites of Polderweg and De Bruin (*e.g.* Louwe Kooijmans 2003).

Features - Features are often found on the slope of the dune. This may, however, be a remnant pattern since structures and features on the top often have eroded due to the more extensive exposure of these areas to the elements and subsequent activities. Overall it is suggested that the top was the main habitation area (see for example the donk of Brandwijk, Appendix I).

Potential - Sites located on *donken* are extremely informative due to the preservation of organic remains and other sources of information related to, for example, subsistence, environment and seasonality. In the case of regular and adequate sedimentation, preservation of spatial patterning in a chronostratigraphic context is possible. Nevertheless, sites on donken suffer from specific problems. Often the information from the top of the donk can be considered a palimpsest or is completely absent due to postdepositional processes. This may even lead to a 'decapitated' profile. That part of the site can therefore be more or less characterized as of an upland nature. Due to the same and other processes there is a complex interaction between natural and anthropogenic agents responsible for spatial patterning of artefacts and other debris on the slopes and at the foot of the dune. This pattern contrasts with the organic and anorganic artefact pattern at wetland sites suggested by Groenewoudt (1994, 128-129 as well as fig. 46, pp. 133). Based mainly on an analysis of the TRB-site of Slootdorp-Bouwlust it is suggested there that the proportion of organic remains is higher at the centre of the site. The donken sites indicate exactly the opposite. Virtually all organic information from the top is lost and most anorganic finds also cluster on the slope. Unfortunately this difference in preservation often poses a difficult problem in interpretation, since it is very difficult to correlate the stratified information from the slope and foot with activities and features that occurred on the top.

Site function - No clear information on the character of sites on donken and wetland dunes is available, yet it is noteworthy that, until now, all sites have yielded a distinct amount of domestic evidence, either in the form of pottery, faunal remains, grinding stones etc., that points in the direction of a shorter or more elaborate domestic function. It is probable that the dry situation of these locations in a wetland environment leads some form of investment and permanency, although other site functions may have operated coevally.

Examples - Hardinxveld-Polderweg, Hardinxveld-De Bruin, Brandwijk, the Hazendonk, Urk-E4.

4.5.2 Moderate wetland sandy elevations (coastal dunes and barriers up to c. 1m)

The tripartite division existing for *donken* sites can also be made for coastal dunes and barriers. The difference is that the overall available area existing for habitation is more extensive while the gradient of the elevation is often less steep. On the other hand the dynamic environment of the coastal area might lead to large-scale erosion of parts of sites. On larger coastal ridges wetland preservation may be largely absent. This means more of an upland character for sites in these areas.

Finds - The slopes of the dunes again form the background for most finds, although the quantitative and qualitative aspects of the faunal remains of Wateringen IV indicate that the tops of these elevations also harbour important activity and dump areas. Dependent on the local geomorphological situation and the location of the excavation, the number of finds may range from several dozen (as at Haamstede-Brabers) to many thousands (Schipluiden). Furthermore sites such as Wateringen and Schipluiden demonstrate that the spatial distribution of finds and the existing concentrations are much more a reflection of anthropogenic activity than of taphonomic processes (as was the case for the donken sites).

Features - Features mainly cluster on the top and sides of the elevation, although in some cases such as at Ypenburg entire parts of the top were also lost. In most cases the features that survived much more represent intra-site structuring than the remnant distribution of features that survived intensive postdepositional processes as at many donken sites. Apart from this the actual length of occupation of the site in combination with the rate of coverage might lead to intangible clusters of features, such as documented at Schipluiden. On the other hand clear site plans were found at Ypenburg, Wateringen IV and Haamstede-Brabers.

Potential - Overall, sites on coastal dunes and barriers seem less affected by postdepositional processes in relation to slopes than, for example, donken. This implies that while marine transgressions and related phenomena may destroy large parts of sites integrally, the intrasite patterning in many cases will be informative. Sometimes a clear relationship might even be attested between finds and features as, for instance, at Schipluiden.

Site function - Most characteristic site information stemming from coastal dunes is of a domestic, residential nature. This can be of a more permanent and community character as at Schipluiden, or more singular as at Wateringen IV. Important is the presence of house plans or indications thereof at most sites. A site such as Ypenburg may in this respect be interpreted as a 'multiplied version' of Wateringen IV (see Louwe Kooijmans 2009), or it may be attributed to the category 'multiple clusters' (see below).

Examples - Haamstede-Brabers, Leidschendam, Schipluiden, Wateringen IV, (Ypenburg).

4.5.3 Low elevations (levees and low sandy elevations)

Another type of site is mainly different with respect to the distribution of finds and features. Although a basic tripartite subdivision as postulated above can also be applied here, the distribution and preservation of both finds and features is much more uniform. This may related to the height of the elevation and the rate of coverage, in combination with the (spatial) character of occupation (see also multiple clusters). These sites occur in upland and wetland locations, such as levees and low sandy features.

Finds - The distribution of finds (flint, pottery and organics) is oriented on the centre of the site. Concentrations do exist yet overall the quantity decreases towards the edges of the elevation.

Features - Features mainly cluster on the top and sides of the elevation and generally coincide with the distribution of finds. Dependent on the intensity and character of re-occupation in combination with postdepositional processes structures may (Vlaardingen, Swifterbant-S3), or may not (the Hoge Vaart, Bergumermeer) be visible. In upland locations or under upland conditions the feature information may be severely restricted or absent.

Potential - Accumulative sites have a distinct centre which recurrently formed the location of occupation. This is also where finds and features cluster. The reason for this patterning with a clear fall-off curve is not known. It may be related to the limited amount of space that was probably available at, for instance, sites such as Vlaardingen and Swifterbant-S3. In the case of activities executed in the vicinity of a dwelling structure or house this may generate a centred pattern. On the other hand a similar pattern is visible at Hoge Vaart where space is less limited. The existence of this kind of patterning is also strongly dependent on the area that is excavated as well as the preservation of the highest parts of an elevation. Other elements at a site such as another elevation or a channel may have formed the focus of other structures and activities. The combination of sites and finds may yield potential information on activities related to structures (*e.g.* Raemaekers *et al.* 1997; De Roever 2004).

Site function - The site function of accumulative sites seems varied. On the one hand it may involve semi-permanent and domestic sites such as, for example, Swifterbant-S3 and Vlaardingen. On the other hand the occupation may be more residentially mobile and repetitive as at Bergumermeer. The characteristics are of course also strongly influenced by the settlement system type of the occupants. The fall-off curve of artefacts and features is induced both by the nature of the location and the recurrent focus on a centre of occupation. Both domestic sites and camps of hunter-gatherers fall within this category.

Examples wetland - Bergschenhoek, Hoge Vaart, Slootdorp-Bouwlust, Swifterbant-S3, Vlaardingen.

Examples upland - Bergumermeer-S64B, Gassel.

4.5.4 Multiple clusters

This type of site occurs both in uplands and in wetlands and consists of two or more clusters which are spatially separated. Upland sites are mostly of Mesolithic age while Middle Neolithic counterparts occur in the wetlands. The individual clusters are of different shape and extent, but their size is usually limited up to approximately 200 m^2. The intermediate area between the clusters is not empty, isolated finds and structures might be located there and the individual clusters may also overlap to a certain extent. The clusters are usually found on the top and slope of an elevation, although lower locations are also possible, especially on upland sites.

Finds - Upland Mesolithic flint scatters consist of concentrations of flint, often oval in shape. Within these concentrations clusters might be visible (as for instance at Brecht-Moordenaarsven 2). Refit lines either indicate the contemporaneity of the formation different clusters or their visibility on the surface during occupation (and hence re-use of material). At wetlands sites sherds and organic remains can also be found within the clusters.

Features - At some upland sites the remains of hearths or singular pits coincide with the concentration of artefacts (for instance at Opglabbeek Ruiterskuil, Weelde-Paardsrank, or Merselo-Haag). At other Mesolithic upland sites clusters of hearthpits, that to some extent may be structured chronologically, usually occur away from the artefact distribution (see Chapter 5). At wetland sites the remains of structures and hearths have been documented (see for example Hekelingen III and Liège-Place St.-Lambert).

Analysis - Sites with multiple clusters are interesting because they are indicative of a specific use of a certain feature in the landscape. There may be an overlap in time and space of activities and structures as certain concentrations are renewed and structures rebuilt (see for instance Hekelingen III). The existence of multiple clusters may point to the long-term use of and perhaps movement along a certain landscape feature in the landscape such as a dune (see for instance the site of Lommel-Molse Nete) as well as to the contemporaneity of certain concentrations (Merselo-Haag, Hekelingen III). These observations should subsequently be translated into hypotheses about mobility cycles, households and internal site structuring. Overall these sites indicate a non-permanent use of the same locations in a landscape, often over extended periods of time. In this respect they form small-scale, interrelated versions of accumulative sites. The degree of clustering of activities may inversely point to the duration of occupation (see Schiffer 1972)

Site function - The multiple nature of these sites indicates several contemporary or subsequent foci of activity. Due to their often limited size these more or less fall either within a range of hunting camps (Weelde-Paardsdrank), or can be classified as domestic sites occupied for a limited time period (Hekelingen III).

Examples wetland - Hekelingen I, Hekelingen III, Liège-Place St.-Lambert.

Examples upland - Brecht-Moordenaarsven 2, Mariënberg, Meeuwen in den Damp I, Merselo-Haag, Opglabbeek-Ruiterkuil, Weelde-Paardsdrank.

4.5.5 Distorted sites

This is an additional category comprising the large variability existing in predominantly post-Mesolithic upland sites, or sites in wetland areas that are largely characterized by upland conditions. This variability is to a significant extent induced by postdepositional processes, indicating that some of the sites within this category may have originally fitted another category.

Finds - At many sites finds have to a large extent been dislocated or displaced completely due to bioturbation and erosion of the covering layers. Most sites thus can be considered palimpsests (Swifterbant S22-24, Helden-Panningen-Industrieterrein, St.-Odiliënberg-Neliske). Organic remains are, furthermore, scarce due to the acidic conditions of the soil. Pottery may be affected as well. In some cases pottery and other finds are preserved more or less in situ in pits or natural features such as depressions (*e.g.* Grave-Pater Bertierstraat, Nijmegen-'t Klumke, Wijchen-het Vormer).

Features - Features are partially present or wholly absent, dependent on the negative effects of erosion. Often the absence of finds within the features in combination with poorly associated ^{14}C samples makes it difficult to attribute features to a certain period. This way virtually no or only questionable structures can be defined (*e.g.* St.-Odiliënberg-Neliske, Helden-Panningen-industrieterrein).

Potential - The variability in this category of upland sites makes it difficult to describe them as a whole. In general they are characterized by the fact that either features or finds suffer considerably from postdepositional processes and surface exposure and in some cases both. This makes it extremely difficult to interpret these categories for themselves, let alone combine both into the analysis of a settlement or other type of site.

Site function - Because of severe taphonomic disturbance these locations harbour sites of different character. Both hunting locations as well as domestic sites might be represented, but identification of site function is often impossible.

Examples wetland - Swifterbant S22-24, S11-13, Swifterbant-S61.

Examples upland - Helden-Panningen-Industrieterrein, Meeuwen-Donderslagheide, Nijmegen-'t Klumke, St.-Odiliënberg-Neliske, Wijchen-Het Vormer.

4.5.6 Isolated sites and off-site finds

This category consists of small-scale sites and finds that are often situated rather isolatedly in the landscape. They occur both on the uplands and in wetlands and are the material reflection of singular short-term activities, transitory camps, depositions etc.

Finds - The finds at these types of sites are usually very limited (see for instance the flint assemblage of Jardinga). Other remains such as bones might be more numerous, but of course this also strongly relates to the function of the place and to postdepositional processes. The limited number of lithics, however, demonstrates that the visibility of these sites in an upland context might be extremely limited.

Features - In general features are not to be expected since these locations were only used for short periods of time. Structures or other installations related to the specific use of a site as well as hearths form an exception however.

Potential - Isolated sites and finds might yield qualitatively detailed insights into the short-term special activity sites employed by hunter-gatherers and early farmers. These sites are, however, notoriously difficult to identify, especially in upland conditions. Furthermore the information they might generate is strongly dependent on good conditions of preservation and the absence of subsequent occupations blurring the available resolution due to the palimpsest effect.

Site function - Sites within this category are often marked by a spatially and chronologically limited congruence of finds and features. This indicates that in most cases these sites may be interpreted as short-term camps, hunting or fishing stands, butchering sites or intentional depositions.

Examples – Bergschenhoek (also fits the accumulative site category), Bronneger, Jardinga, isolated axes, isolated antlers, hoards, pot burials or other intentional depositions.

4.5.7 Using site templates

The introduction of site templates is not so much informative with respect to the actual prehistoric site functions as that it reflects the ways we as archaeologists may encounter sites and the information preserved there. Within the latter perspective site templates form reflections of the way the material derivatives of human behaviour interact with the conditions generated by the environment and shape use or occupation types. This approach may, in some situations be more informative than, for example, the site resolution approach (see Peeters *et al.* 2002, table 5, pp. 110), since the categories defined above are both descriptive and fluid. It should be realised that under certain conditions similar sites will develop differently and generate a different material reflection. Furthermore, as argued earlier, and depending on the characteristics preserved, sites may fit more than one category. These templates therefore are not intended as an absolute subdivision. It is our task to try and define what types of sites are at the basis of the variability described above and how these fit into a system. The main difficulty we thereby face is the contrast between qualitatively highly informative wetland sites as opposed to different degrees of far less informative sites, often located in the uplands. How to deal with this discrepancy will now be discussed.

4.6 Representativeness

In Chapter 2 it was argued that the study of the process of Neolithisation on a European scale had to some extent drifted further away from the material reality of the archaeological record. Instead of a top-down theoretical approach in which data is molded to fit internalist or externalist argumentation it was argued that the mosaic character of the transition to agriculture in Europe required an open minded, bottom-up approach within a regional perspective (see also Amkreutz/ Vanmontfort 2007; Arnoldussen 2008). An important contribution to such an approach was formed by a thorough analysis of the inferential power and constraints of the archaeological record in the study area, involving a taphonomic reconsideration of the 'building blocks' of our 'Neolithisation story', the sites. Within this analysis the archaeological record of communities in transition to agriculture within the LRA was reconsidered both from a methodological as well as a formative perspective, addressing such diverse issues as excavation strategy, sampling traditions, theoretical paradigm, geographical diversity, bioturbation, permanency, duration and spatiotemporal collapse. This analysis, based on a number of sites described in the catalogue, demonstrated the existence of huge qualitative and quantitative contrasts within our dataset. The *Leitmotiv* of these diverging results centred on the upland-wetland bias. This bias is problematic because it means that we study the transition to agriculture and understand the process of Neolithisation through a largely unbalanced dataset.

4.6.1 Qualitative potential

From a geographical and archaeological perspective we see and understand more of the 'receiving end' of the process of Neolithisation, the wetland reflection and subsequent wetland implementation of contacts and developments that also took place elsewhere. The importance of these wetland sites for our understanding of the transition to agriculture is evident (see also Nicholas 1998[a,b]; Van der Noort/

O'Sullivan 2006) as they are able to provide more and better answers to many issues and questions surrounding Mesolithic and Neolithic sites and the process of Neolithisation. An estimate of this difference in potential has been visualized in fig. 4.13, based on the information drawn from sites in Appendix I.

The attribution and subdivisions visualized in fig. 4.13 are an approximation of reality and will be different per site studied. Nevertheless, the overall implications are clear and are further illustrated by the cumulative pie charts in fig. 4.14. These visualize that, especially with respect to medium and high levels of information, wetlands and uplands contrast.

What these figures indicate is that much of our most valuable information for studying the transition to agriculture in the LRA will derive from wetland sites. On the other hand it is also clear that this contrast may be problematic in our understanding of this same process, because of the danger of a singular wetland perspective on the transition.[14] For example one of the major issues in the debate on Neolithisation is the introduction of cereals and the growing of crops. Geographically one might assume that the first introduction of cereals and the experimental phase of agriculture would have taken place in the contact zone between the Neolithic farmers of the LBK on the one hand and the Rössen culture on the loess and adjacent hunter-gatherers on the sandy soils on the other hand. Taphonomically, however, this is precisely the area where organic remains such as cereals and chaff and to a certain extent even pottery are not or only very poorly preserved, pollen diagrams are regional in perspective and suffer from hiatuses (with some exceptions, see Bakker 2003[a]), ^{14}C dating is often inaccurate, features dissipate, use wear analysis is regularly ineffective, and spatio-temporal control is lost due to a stable surface, re-use and the absence of a cover. The evidence probably was there but is not anymore. What we do see is a geographically and chronologically specific version of this process. A wetland reflection, adaptation and implementation of something that, presumably, initially took shape elsewhere. This is a unique situation that not only differs from the upland counterpart to which it is related, but is also different from other wetland situations. For Switzerland the prehistoric lake villages form the main source of information, also for the Neolithic. In Britain and Ireland, wetlands rather form isolated datasets, such as the Fenlands or Glastonbury lake village. Apart from these examples valley floor locations form additional wetland settings, often of a smaller scale such as Noyen in France. The best reference for the LRA wetlands may be found in Schleswig-Holstein and Denmark, however, it is mainly the Mesolithic that is found there in wet contexts (pers. comm. Louwe Kooijmans 2005). The LRA wetlands therefore should be studied in their own right as a specific regional phenomenon.

4.6.2 'They do things differently there?'

In L.P. Hartley's novel 'The Go-Between' (1958) the past is a foreign country where they do things differently. In a way one may assume that wetlands have the same denotation since they often have been and still are perceived as inhospitable wastelands (see Louwe Kooijmans 1997, 10-11). To what extent could this be true? Before we enter into this discussion some comments on the general division between upland and wetland sites are in order. From a taxonomic point of view both terms are used to pigeonhole sites, which might intrinsically be very different. For instance the sites of Schokland-P14 and Hoge Vaart are not

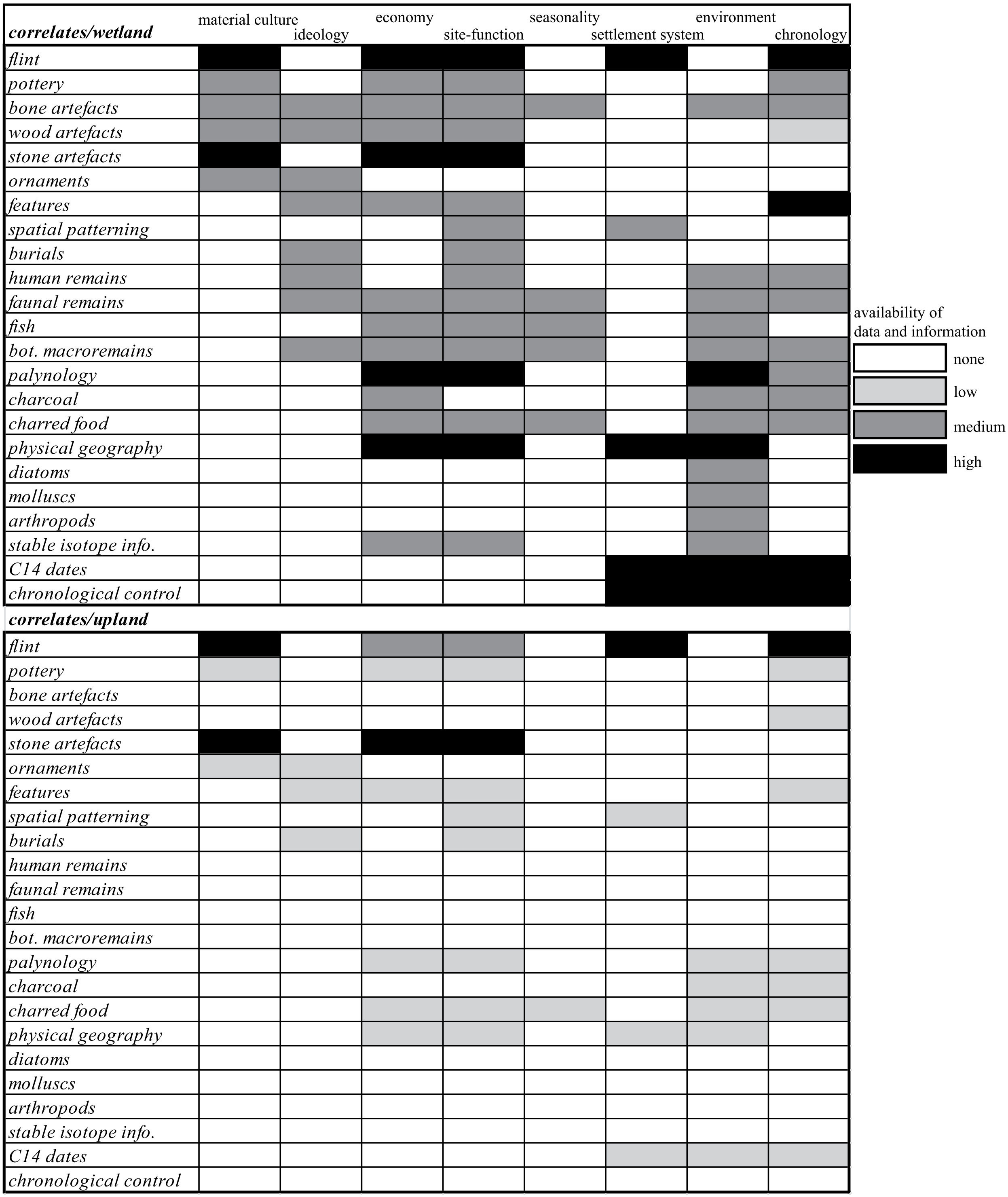


Fig. 4.13 Availability and quality of archaeological correlates for upland and wetland sites with respect to topics of importance in understanding the process of Neolithisation.

entirely comparable to donken-sites such as Hardinxveld-Polderweg or Brandwijk (see Appendix I). During a large part of their occupation, both of the former sites were located much more in an upland environment adjacent to a wetland with extensive areas of 'dry land' in their direct vicinity. This strongly contrasts with the latter sites which were located in the middle of a wetland. Nevertheless,

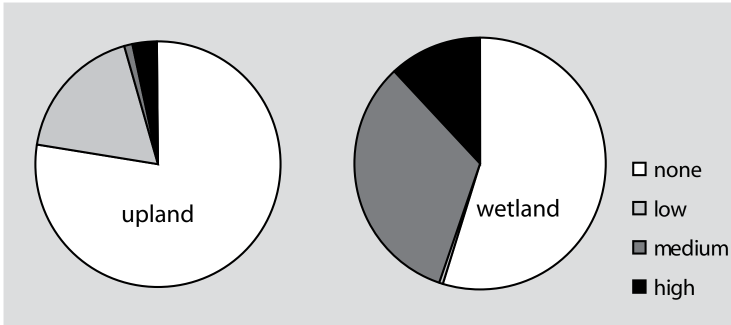


Fig. 4.14 Cumulative pie-chart counts of fig. 4.13 illustrating the informative contrast between wetlands and uplands.

all would usually be classified as 'wetland' sites, because of their conditions of preservation and adjacency to considerable bodies of water. It should thus be noted that the distinction upland-wetland often most unambiguously is a distinction between conditions of preservation (*cf. supra*). The archaeological, ecological and interpretative applications, although equally valid, are often far less obvious and positioned on a sliding scale.

Wetlands as uplands?

For some authors the same agents that led to the excellent preservation of sites in these areas are also indicative of a prehistoric situation that was distinctly different from any upland situation. In their view this dichotomy must have resulted in considerable socio-economic differences to the extent that uplands and wetlands should be perceived as largely incompatible entities (see for example Groenewoudt 1994, 53; Nicholas 1998[a], 720). In this light it is thus not useful to embark upon a comparative study of wetland and upland sites.

Others have, on the other hand, argued that the upland-wetland distinction is mainly a creation of our modern ethnocentric attitude and geological erudition (Louwe Kooijmans 1999, 111). The current subdivision into upland and wetland sites, to some extent, is definitely an artificial segregation in which often no clear distinction is made between past environment and preservation conditions (*cf. supra*). In this perspective the difference between wetlands and uplands is much more gradual with a moderate distribution between wet and dry elements (Louwe Kooijmans 1997, 15). Clearly there are also large bodies of water (lakes, streams, fens) in upland contexts. The argument that prehistoric communities did not submit or adjust to the whims of the environment but instead were governed in their choices and patterns of land use by social relations and human culture (see also Brandt 1988; Gamble 1986[b]) substantiates the claim that an upland-wetland divergence should not be treated as an absolute categorization. From this perspective wetland sites, to some extent, may serve as a high resolution version of what happened at upland sites.

The question is how to deal with this seemingly diverging perception of the role of wetlands in relation to past behaviour? Are wetlands absolutely non-representative or, on the other hand, if not illustrative, do they represent at least part of the wet side of a range of acceptable lifestyles (Louwe Kooijmans 1999, 111).

Approaching wetlands

Both interpretations have their shortcomings in addressing the issue of representativeness. Wetlands certainly cannot be seen as backward fringe areas where habitation could only have had a very specialist and irregular character (*e.g.* Louwe Kooijmans 1997; Nicholas 1998[a,b]; 2007[a,b]; Van de Noort/O'Sullivan 2006). On the other hand nor should they be perceived of as only gradually different from what was common on the upland, since their conditions would demand a rather different use of the environment. In the last case the specific accents of wetland occupation might distinctly deviate from elsewhere. A difference of degree may still be a considerable difference when studied qualitatively.

This study sets out to study communities in the LRA wetlands in the process of Neolithisation from a flexible perspective, both with respect to the occupation history of wetlands as well as in relation to upland developments.[15] A context for this was offered earlier in Chapter 3, where it was argued that the debate concerning the transition to agriculture should be injected with historicity. In the LRA as well as elsewhere in Europe, we are dealing with a spatial as well as chronological mosaic (*cf.* Tringham 2000[a]) of transitions and especially for the LRA wetlands no clear or simple universal or evolutionary trend is definable. Although there are distinct developments towards an agricultural economy, the process is gradual and the occupation history is characterized by continuity in behaviour rooted in the hunter-gatherer world and diversity in dealing with the environment and resources. Different choices and combinations seem to have existed side by side. While this will be further discussed later on (Chapters 7-9), it means that a research perspective should not only focus on the adaptive qualities of these communities adjusting to the optimal use of their environment. It should also deal with the long-term relationship between communities and environment and the way this over time shapes types of habitation and practices characteristic of both these communities and the area.

The main point to be made is that wetland developments may be studied for the light they shed upon (archaeological patterning of) occupation elsewhere, but simultaneously deserve an analysis and interpretation of their own, based on the geographically and ecologically specific qualities they harbour and the way in which they influence regionally specific behaviour, choices, habitation and identities.

4.6.3 Wetlands as active agents?

Within the approach sketched above wetlands (both from a landscape and environmental perspective) are ascribed distinct qualities, which provide certain regionally specific structural conditions (see Barrett 2000 and Chapter 6). These in turn and over time confront and interact with the communities living in these areas and will contribute in shaping community choice and cultural characteristics. Although we can only guess, or approach ethnographically, how this may have taken place this perspective is based on the idea that wetlands are attributed certain formative qualities (Coles/Coles 1989). These are of importance in the organisation of groups living completely or partially in these landscapes and the way in which they negotiate and transmit community identity (Van de Noort/O'Sullivan 2006, 68). This approach will be theoretically anchored and further implemented in Chapters 6-9. These chapters will specifically focus on the communities in the wetlands and wetland margins. The next chapter will provide an archaeological basis for this through a comparative study of the available contextual and artefactual evidence regarding Late Mesolithic communities in the LRA. The chapter will deal with the degree to which these groups may have operated differently in different areas and to what extent this may have provided a heterogeneous substrate for the transition to agriculture.

Notes

1 The actual situation is more complex and also depends on the acidity or alkalinity of waterlogged environments. For example acidic peat bogs preserve wood and plant remains, but may eventually destroy bone and even pottery. Alkaline environments on the other hand are less conducive to the preservation of wood, plants, leather and pollen and more so to the preservation of bone and shell (see for example Coles/Coles 1989; Groenewoudt 1994; Renfrew/Bahn 1996).

2 Many processes influence the preservation of features. Apart from cultural factors such as backfilling and secondary use, bioturbation, soil formation and erosion have a significant impact. They obscure the extents and outline of features and often only a decapitated profile or section is preserved. These considerations warn against an uncritical interpretation of finds within features for functional or dating purposes (see also Schiffer 1987, 218-220).

3 This term was originally used in a different context, referring to the dangers involved with thinking in and with chronological units in the Palaeolithic (see Conkey 1985; 1987).

4 Lucas (2005, 34-36) argues that at another level the archaeological record is never static. In fact it is always dynamic and part of a systemic context, whether below or above the ground. If it is visible and tangible humans will have to deal with it, *i.e.* interact with, accept, or ignore it. It is therefore also related to people's perception of the past.

5 This was also practised at recent excavations conducted by the RCE at Rijckholt-Sint-Geertruid. Personal information, author.

6 There is evidence of severe taphonomic disturbance of features dating to this period (*e.g.* Burnez-Lanotte *et al.* 1996; Groenewoudt 1994; Vanmontfort 2004; see also below). Groenewoudt (1994, 113) mentions the disturbing effects of bioturbation and soil formation processes leading to the gradual disappearance of features, especially on well-drained sandy soils. Features have often disappeared or are only visible at a lower level and thus easily missed. Apart from these considerations, the total number of Neolithic upland excavations, excluding the LBK, is limited (*ibid.* 112), indicating that these sites are not easily detected.

7 The cause is mainly found in the consumption of non-terrestrial food such as fish and shellfish of marine and freshwater origin. This can be traced by measuring the levels of the stable isotopes $\delta^{13}C$ and $\delta^{15}N$ in the bone collagen. The latter is often not measured (Lanting/Van der Plicht 1995-1996).

8 It must be realized that the reservoir and hard water effects affect sites in the wetlands not only because of their preservation of organic remains, but also because wetland resources often formed an essential contribution to wetland subsistence and technology.

9 See for instance the different quantitative results for the hand-picked and sieved remains of fish at Schipluiden (Brinkhuizen 2006).

10 Where Foley (1981, 165-166) opts for introducing 'off-site' archaeology as a conceptual counterpart for a site approach, Dunnell (1992, 36-37) proposes to reject the archaeological concept of the site altogether. Instead he argues for a bottom-up approach using artefacts and their attributes as the smallest units of (spatial) analysis. The same approach is advocated by De Loecker (2006, 8; see also Roebroeks *et al.* 1992) when he methodologically 'discards' the site-concept in favour of a spatial distribution of artefacts along a continuum from individual artefact to high density pattern.

11 Binford (2002, 132) adds to this: '*…archaeology's basic unit is the individual site, but its goal is to employ these units to study past human behavior; and in order to accomplish this task, we need to develop an appropriate methodology for identifying the role of single sites within an overall system.*'

12 NOaA is the abbreviation of Nationale Onderzoeksagenda Archeologie, or National Research Agenda for Archaeology (for more information see http://www.noaa.nl/). The agenda is intended to spearhead and define the important goals of Dutch archaeology per time period and function as a guideline for commercial archaeology. One of the dangers of documents like these is that they are not continually updated and eventually function in a dogmatic way achieving precisely the opposite of what they were invented for in the first place.

13 In relation to this it should be stressed that the public goals of disseminating information to a wider lay audience, as is laid down in the Malta law, is crucial for creating an increased understanding of the importance of archaeology for our cultural heritage in general. At the same time the role of this audience and investors in determining the course of research or even emphases in heritage

management on a local or regional level should be limited. Recently there have been questionable initiatives in the commercial sector (especially within the branch of advisory companies), such as 'Reverse archaeology' that propose a stronger influence of the public and other stakeholders, such as construction companies and municipalities, in deciding on the emphases in archaeological fieldwork and interpretation.

14 Bailey (2007) argues that within the remnant settlement patterns we reconstruct, sites representing cumulative palimpsests (*i.e.* the wetland sites in the LRA), achieve prominence and visibility for reasons less related to their significance to the original occupants than to the frequency of revisiting and re-use. This underlines that issues of visibility, preservation, re-use and importance operate independently from each other.

15 From an archaeological perspective we find ourselves in a somewhat paradoxical situation. On the one hand wetland sites are our most important sources of information on the development of the transition to agriculture. Without them we would actually have hardly any information at all. On the other hand we should not regard them as either representative or completely divergent (*cf. supra*). They cannot form a template for what was going on elsewhere in upland situations. A further argument in this respect was brought to the fore by Binford (1992, 49) when he stressed that focusing on 'good sites' alone is a 'let's-look-through-different-glasses' approach. This way we are bound to observe new things, but will not be able solve the relationship between these and our old problems. How to proceed?

One way forward could be to abandon the strict distinction between 'good sites' and 'bad sites' and accept that most sites within the available dataset have to some extent suffered from the same taphonomic distortions (see Binford 1987[b] where he argues that deposits and excavated sites do not differ that much from surface sites since both have been subject to palimpsest effects. Excavated sites are in fact buried surface collections). In this respect there are only different degrees of 'ugly' sites. If then, from a site-formative perspective there is no insuperable contrast, we might use the best sites available to form a well-informed background to compare less informative sites to. For the LRA this will result in a situation whereby wetland sites are used to study upland sites. The beneficial aspects of this approach are thus not to be found in the informative value of sites *sensu stricto*, but in the similarities and divergences between them. In using a comparative approach the wetland sites form real 'sites for sore eyes'. This perspective should, however, not interfere with analyses that approach and interpret the wetlands, their conditions and the occupational behaviour it generates from a regionally specific perspective. Whereas one approach uses wetland data in order to understand similar or diverging upland patterns from an archaeological and formative perspective, the other stresses the behavioural character of communities from a regional perspective wherein geographical and ecological conditions actively influence behaviour.