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# Discussion of the Influence of Prehistoric Humans on soils in the British Isles

## Introduction

This paper will attempt to give a broad overview of the of recorded human impact for the prehistoric of the British Isles. To aid conceptualisation of such a large time frame (12,000-1,000 BC) discussion will be made for the Mesolithic, Neolithic and Bronze Age to Iron Age. The Iron Age will be largely ignored as that which does not overlap with the Bronze Age overlaps with Roman and more historical influence. Examples will be brought in from across the British Isles but for the benefit of continuity of discussed sites and to aid synthesis the main examples are restricted to England. Models of human impact and those authors who have distinguished heavily between activities in the different prehistoric periods will be used to framework the discussion. The overall impact of prehistoric people on their surroundings is a decline in the arboreal taxa. Inversen's "Landnam" model, reviewed by Edwards (1993), is a much more useful consideration of a logical process of any intentional human impact, but the unintentional will also be studied. A wide range of source types, from pollen, charcoal, molluscs, buried soil micromorphology and chemical analysis will be combined with utilitarian and social approaches to explanations of activities.

## Mesolithic

Table 1 shows the general human impacts seen in the Mesolithic of a few choice authors. As can be seen the interpretations of Mesolithic peoples' environmental impacts vary, but around a central theme of woodland disturbance. The majority of them have generalised these findings for specific regions. Such as Dartmoor (Simmons 1969), the English chalklands (Evans 1993) and the area around Stonehenge (Allen 1997). The last in the table is a model of North West European human impact, which has been proposed to still be applicable to the British Isles (Edwards 1993; 133). Other competing model's, the Landnam and expansion-regression models for instance, reviewed by Edwards (1993) are generalised approaches to the interpretation of human exploitation predominantly for Neolithic pollen assemblages. The forest-utilisation model is much more specific account of what happened in the prehistoric while the Landnam proposes an order of human activity in woodland clearing. The expansion-regression appears as a synthesis of both types.

| | **Proposed human impact in the Mesolithic** |
|---|---|
| **Simmons (1969)** | Pollen evidence for temporary or local to permanent woodland clearance. Little disturbance with localised soil leaching and some blanket peat formation. Loose association with archaeological artefacts. |
| **Evans (1993)** | Pollen evidence for temporary or local woodland clearance. Loose association with archaeological artefacts. |
| **Allen (1997)** | Pollen evidence for woodland clearance but unknown how widespread. Loose association with archaeological artefacts. |
| **Göransson's Forest-utilisation Model. (Edwards 1993)** | Girdling of broad leaves trees in the climax forests. |

Table 1 - Proposed human impact in the Mesolithic

The models discussed above do restrict themselves either in human activity or temporal framework. Edwards has previously stated that intentional human acts on woodlands can be in many forms. By axe, fire, girdling or grazing and identifying these different activities in the pollen record are a major problem (Edwards 1979; 256). Evidence of temporary or local woodland clearance is recorded at the Callanish area, Isle of Lewis (Bohncke 1988; 451) Upland Ardudwy, North West Wales (Chambers, Kelly and Price 1988; 340) Oakhanger, Hampshire and Iping Common, Sussex (Butzer 1982; 138-9) to name but a few over a wide geographical range.

Mesolithic human clearance phases are proposed at these and many other sites primarily due to corresponding charcoal layers and decreasing pollen counts. With the question of whether charcoal layers are anthropogenic or natural always being present there are two main approaches used to validate claims. The first is comparison with return periods of natural fire in the area, with return periods in analogous woodlands and with data on the size and burning capacity of natural fires (e.g. Simmons & Innes 1996a; 190) and the second is association with archaeological artefacts (e.g. Evans 1993). A combination would of course be preferable but on the whole archaeological assemblages are only "*loosely*" associated (Edwards 1993; 150) with recorded charcoal layers. Hopefully problems such as this will begin to be solved by excavations such as Goldcliff East, Severn Estuary (Bell et al. 2002) where microliths have been found directly associated with a charcoal layer. Questions raised about whether charcoal layers are a result of domestic fire rain (Edwards 1969; 256 Simmons 1993; 111) and an improved framework for applying the charcoal data will hopefully come out of work like Blackford (2000) and Moore (2000).

Other routes to anthropogenic woodland clearance or management are even less visible in the pollen or archaeological record. The previously mentioned coppicing or girdling may have little noticeable affect on the assemblages (Edwards 1993; 141). The only way to see such small scale and localised clearances using methods such as axe felling appears to be in high-resolution pollen studies. Although detailed pollen studies are being carried out for later periods (e.g. Turner, Innes & Simmons 1993) they are rare for the Mesolithic.

Much of what is discussed above is intentional human impact on the environment. This assumes there is a reason for these localised clearings in the Mesolithic. The proposed reasons generally entail creating clear ground that is attractive for hunted game or to acquire wood (Turner, Innes & Simmons 1993; 606). Allen's findings of a clearing with four wooden posts in it dating to the 8th millennium BC (Allen 1997; 125) could raise valid questions about a possible secondary or primary function of these clearings being non-utilitarian.

The non-intentional affects of these proposed human activities also need to be considered. Rapp and Hill discuss the increasing incidence of fine-grained clastic material and changing soil salt concentrations with decreasing woodland (Rapp & Hill 1998; 110). These authors have introduced these as simple correlations. Instead they need to be placed within a more holistic framework of deforestation effects and influences on soil. Butzer highlights a number of case studies in which an increase in soil acidity correlates with deforestation (Butzer 1982; 135) and discusses them in a wider ecological context. Micromorphological work complemented with other sedimentalogical analysis on the buried soils from which pollen samples are taken would be an ideal way to assess human impact in the case of the evolution of the soil. However, work on the Mesolithic in this area is still scarce (e.g. Davidson & Simpson 2001).

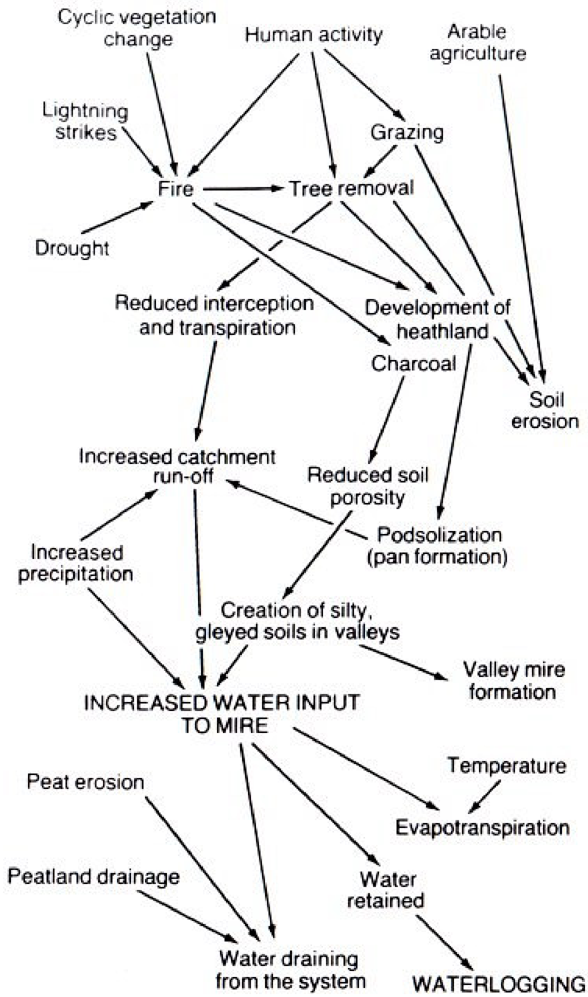


**Figure 1- Hydrological processes leading to waterlogging in a mire (Moore 1993; 219).**

A major area in which an integrated approach is being employed more is in blanket peat formation. Although blanket peat formation continues and may just start in some areas during the Neolithic and onwards, the earliest instances of anthropogenic peat formation in the British Isles is in the Mesolithic (e.g. Turner, Innes & Simmons 1993; 644). Moore (1993) has extensively discussed the issues of human activities in reference to a hydrological model concerning blanket peat formation (see Figure 1).

## Neolithic

The general pattern proposed by the two models in Table 2 of an increase in activity indicated by pollen records is true for some sites, Upland Ardudwy in North West Wales (Chambers, Kelly and Price 1988). There is also evidence for valley bottom closed woodland in England (e.g. Allen 1997; 132), Scotland and Ireland (Edwards

1988; 258). The interpretations from the sites investigated by Simmons (1969) and Evans (1993) give comparable examples of “landnam” style of temporary clearance as well. However, Allen’s (1997; 132) molluscan sequences support the same view of closed woodland in much of the valleys surrounding his sites but proposed phases of later abandonment or regeneration by Evans (1993; 152) and the forest-utilisation and the expansion-regression models (Edwards 1993) are contradicted. Allen does discuss conflicting lines of data but social considerations of the proposed large-scale settlements that should have been around the site may be the key (Allen 1997; 132). This site would turn into the social centre depicted now by present day Stonehenge and viewing it as such may provide a line of investigation as to why the typical “expansion–regression” model (Edwards 1993) was deviated from.

| | **Proposed human impact in the Neolithic** |
|---|---|
| **Simmons (1969)** | Marginal upland impact. Small temporary clearances associated with temporary soil effects. |
| **Evans (1993)** | Evidence for weak basis of cereal production. Woodland clearance associated with settlement.<br>Later abandonment and some woodland regeneration. |
| **Allen (1997)** | Small-scale activity of a not wholly sedentary population.<br>Clearances primarily for grazing.<br>Moving to larger clearances for grazing and some cultivation. |
| **Forest-utilisation Model. (Edwards 1993)** | Extensive grazing and large areas utilised.<br>Later coppicing and wandering arable land with regeneration in marginal areas. |
| **Expansion–Regression Model (Edwards 1993)** | Expansion phase with restricted agriculture to a low impact coppicing and grazing phase and subsequent regeneration.<br>Then another expansion phase. |

Table 2 - Proposed human impact in the Neolithic

Abandonment can allow for regeneration but the processes and results aren’t fixed and are a major aspect of human impact during this period. Evans illustrates how this can be considered in Figure 2 for the response to abandonment in different areas around Avebury (Evans 1993; 153).

Another visible human activity in the Neolithic is cultivation. The earliest form of agriculture employed was probably “slash and burn”. This could be recognised by identification of fine charcoal associated with fractured phytoliths and amorphous organic fragments (Davidson & Simpson 1994; 71), but others state that coarse charcoal signifies slash and burn (e.g. Carter & Davidson 1998; 536, Macphail, Courty & Gebhardt 1990; 55). Although evidence of agriculture is present in the Neolithic it is on a very small scale (Evans 1993; 151, Allen 1997; 132). Butzer discusses the effects of increasing cultivation on soils emphasising its modifying and destructive role and the results on fertility (Butzer 1982; 145-7). For the Neolithic’s sparsely populated landscaped the long fallow system of two years or more would be employed. Outlined by Butzer (1982; 147) this method is also present in the forest-utilisation model (Evans 1993; 142). Micromorphological evidence of the manuring of poor soils at Tofts Ness in the Neolithic is evidence of other possible reactions (Davidson & Simpson 1994; 71).

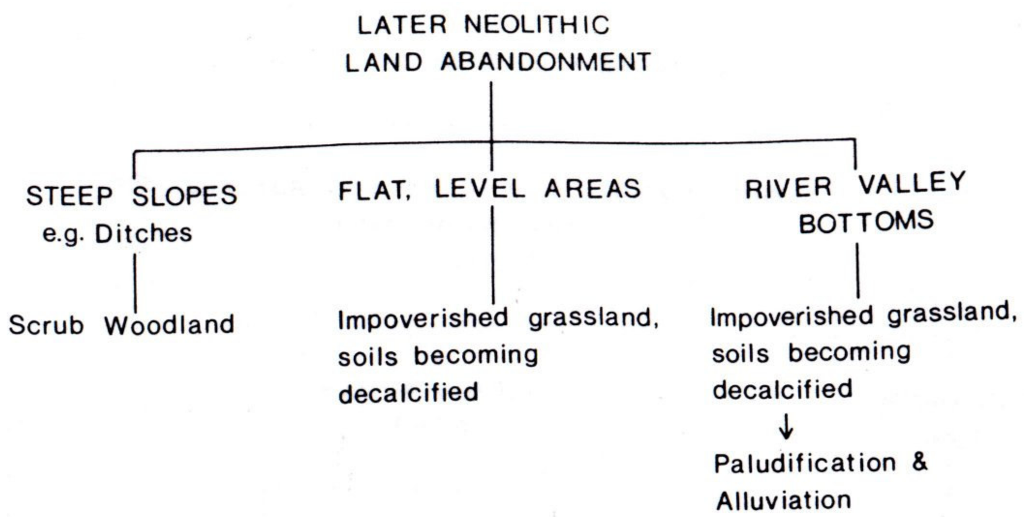


Figure 2 - Response to land abandonment in the Avebury area (Evans 1993: 153).

The majority of the land clearance appears to be for grazing as the “landnan” model proposes (Edwards 1993; 138). In Allen’s investigation of the Stonehenge area limited faunal remains from the Early Neolithic suggest grazing in combination with or driving the woodland clearing and larger herds of cattle on the grasslands in the Late Neolithic (Allen 1997; 127, 132). Herds of animals can also change the nature of the soil with their hooves, by compacting it and reduces its porosity (Butzer 1982; 125).

One of the abrupt vegetation changes in the Neolithic period is the elm decline. It is so distinct that many use it to distinguish between the Mesolithic and Neolithic (e.g. Simmons 1969). Lowe and Walker leave very little room for movement by terming the decline by 73% over six years as being consistent with “pathogenic attack” (Lowe & walker 1997; 270). Turner et al. agree that disease seems the likely cause but that it doesn’t explain the lack of any signs of regeneration (Turner, Innes & Simmons 1993; 646). Many have put forward the reason for this as soil deterioration (Dumayne-Peaty 2001; 390) as a result of increased grazing and burning (Turner, Innes & Simmons 1993; 646). This is plausible and may be indicated at specific sites such as Lismore Fields (Wiltshire & Edwards 1993; 167) but as a general rule human impact; disease and climate should all be initially seen as playing a part (e.g. Edwards & MacDonald 1991; 376, Peglar, Fritz & Birks 1989; 215). The presence or absence these factors play need to be fully evident in the data (e.g. Peglar, Fritz & Birks 1989; 214). In west and southwest Britain the anthropogenic-aided formation of blanket peat, as mentioned in the previous section, is linked to the Elm decline at many sites. Although, the variation of processes in different areas within this region is again emphasised (Moore 1993; 222-3). Göransson’s forest-utilisation model does warn of interpreting the elm decline and subsequent increase of clearance and grazing further a field as intensification (Edwards 1993; 142). They may be following the resources not driving them back.

A lot has been written on the Neolithic elm decline and a telling observation of this is Edwards and MacDonald’s (1991; 376) criticism that later smaller declines have been overlooked.

As considered for the Mesolithic period there are again clearances that appear to have social implications rather then utilitarian functions. Allen records henges constructed in recently cleared woodland (Allen 1997; 132). While Evans discusses different functioning sites being positioned in different environments. Long barrows are predominantly associated with open grassland and causewayed camps are restricted to the woodland edge (Evans 1993; 152). The buildings of such monuments and earthworks during the Neolithic would have had a huge visual impact on the landscape but also on the soils. The experimental earthworks at Overtun Down have shown that erosion of earthworks starts almost immediately (Bell, Fowler & Hillson 1996). After the initial large-scale impact on the sediments lesser impacts will continue as a result of erosion and possible maintenance of the earthwork.

Some of the reoccurring problems in many of these investigations into Neolithic human environmental impact centre on the same thing. Allen repeatedly highlights that the only sequences available in his region of study have an inherent bias as they are all from sites of known human impact (Allen 1997; 127). This illustrates methodological considerations of the need for on-site and off-site reconstructions (Dumayne-Peaty 2001; 385). While other detailed pollen reconstructions proposing human clearance phases and regeneration phases are only tenuously linked to archaeology (e.g. Bohncke 1988).

## Bronze Age to Iron Age

Interpretations of Bronze Age human activity generally reflect another increase in vegetation clearance (e.g. Allen 1997; 133), some associated with artefacts of the Beaker culture (e.g. Evans 1993; 153, Tinsley 1976; 315-6). This increase is proposed as a result of the diffusion of cultivation and the plough and its subsequent affect on population growth (Butzer 1982; 139). However at some sites this expected level of impact isn't so clear-cut. Pollen records for the Carneddau, northern Powys, mid-Wales, show a marked decline in Alnus but little other evidence of human activity. The changing climate was rejected as a reason, as the conditions would have suited Alnus more than other taxa that survived. Human impact was accepted in lieu of evidence at other sites throughout upland Wales (Walker 1993; 180). A number of Southern Scottish sites considered by Mercer and Tipping (1994) show limited vegetation impact and settlement but significant early Bronze Age soil erosion. The combination of scattered farmsteads with a climate of increasing precipitation is used to explain the pattern with the possibility of human induced drainage to account for the higher erosion (Mercer & Tipping 1994; 18-19). Another explanation for only small-scale clearances could be a continuation of the proposed Neolithic method of ploughing between the trees (Macphail, Courty & Gebhardt 1990; 64).

| | **Proposed human impact in the Bronze Age** |
|---|---|
| **Simmons (1969)** | Temporary clearance continuing to permanent clearance with associated soil impacts. |
| **Evans (1993)** | Clearance and cultivation associated with Beaker pottery. The last evidence of widespread clearance. |
| **Allen (1997)** | Increasing cultivated plots on open downland associated with arable erosion of colluvium and pastoral on buried soil. |

Table 3 - Human impact in the Bronze Age

The general trend for increasing agriculture would have major long-term effects on the soil, even just by tilling (Carter & Davidson 1998; 538). Cultivation will break up root and soil structures exposing the now friable soil and increasing its moisture content (Butzer 1982; 125, Macphail, Courty & Gebhardt 1990; 55, Moore, Evans & Chater 1986; 210). Cultivation and the method by which the land was cleared will also have an influence on the continued fertility of the soil. Burning removes a lot of nutrients available to the soil and cultivation oxidation and leaching will reduce the mineral supply further (Butzer 1982; 145, 156). Micromorphological approaches aim to help investigation in this area with the potential to assess the duration of cultivation and the tools used (Carter & Davidson 1998; 538). Present applications of soil micromorphology provide details on processes of clearance, cultivation and then acidification of soils at sites such as Chysauter, Cornwall (Macphail, Courty & Gebhardt 1990; 63).

The response to falling soil fertility is present in thin sections at early Bronze Age Tofts Ness, Orkney. Where signs of increasing biological activity, arthropod faecal remains and turf ash gives evidence of at least two different forms of manure use. The prevalent late Bronze Age, wind blown, calcareous deposits at the site may in part demonstrate the eventual impact of this cultivation (Davidson & Simpson 1994; 71).

The more substantial settlement construction now developing will also have an impact on the soils. Roofs will concentrate rainfall around buildings and human route ways will be subject to intense runoff (Butzer 1982; 127).

A widespread and eventual response to human impact continues in this period. A lack of regeneration of woodland and increasing moisture content leads the way for blanket peat formation in areas such as the Pennines (Tinsley 1976; 316) and Northern Ireland (Moore 1993; 222).

## Discussion

Prehistoric human interaction with the environment has been extensive but also very varied. There still appears to be a trend in the literature to focus upon correlating major anthropogenic “events”, such as the Elm decline, and longer processes like blanket peat formation. Discussions have moved on from just linking the causes and chronologies of sites showing evidence of these issues to discussions of the role of charcoal in water logging (e.g. Innes & Simmons 2000) etc but they are still overshadowing a wealth of other varied human activity to be identified, especially in the Mesolithic.

Discussing impact on soils this paper has tried to avoid an over dependence of referring to pollen records. As Butzer (1982; 149) highlighted twenty years ago the discipline under appreciates the possible human effects on soil and therefore its reconstructive potential. Micromorphology has been applied successfully to sites on the transition to agriculture (e.g. Davidson & Simpson 1994) but little significant work has been again done for the less visible periods of activity. Dumayne-Peaty emphasised the difficulty in reconstructing Mesolithic “trans-human lifestyles” (Dumayne-Peaty 2001; 386) and the question of seasonal differences in impact is rarely raised (e.g. Simmons & Innes 1996b; 617). Although there has been little discussion of it in this paper high-resolution pollen studies (e.g. Turner, Innes & Simmons 1993) can give very detail reconstructions but just as much focus also needs to be applied to associations of these reconstructions with archaeology. The excavations at Goldcliff East, Severn Estuary, are combining many different archaeological, environment and geological sources in order to attempt this (Bell et al. 2002).

There also needs to be a consideration of the ever-present social aspect of human action (Bell & Walker 1992; 148). Especially considering different sites being associated with different landscapes and their impact upon them (e.g. Evans 1993, Allen 1997,). Despite this, the variation of the general trend of increasing exploitation seen in all of the periods discussed above can be explained by the idea of humans trying to avoid the homeostatic response of over burdened ecological systems (Walker & Singh 1993; 104) by developing new technology (e.g. farming) or by other means (e.g. abandonment). Although there is now less of an issue of authors trying to force lifestyles of hunter-gatherer on Mesolithic peoples and distinct agricultural lifestyles on Neolithic peoples, especially considering the variability of the dating of these periods (Edwards 1988; 257,265) the use of such periods to test hypothesis must be balanced with the understanding that these aren't indicative of a linear process of evolution of such things as human impact on soils.

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