Branch age and diameter: useful criteria to recognize woodland management in the present and past?

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fig. 1 Iron age track way Vlaardingen, (© VLAK Vlaardings Archeologisch Kantoor)

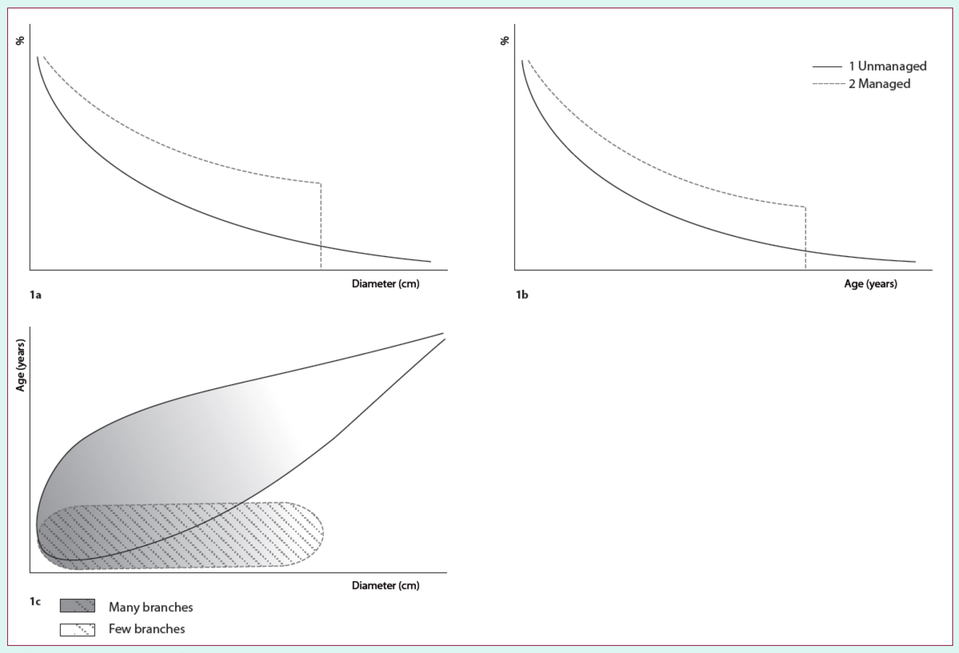

fig. 2a Models for managed and unmanaged wood

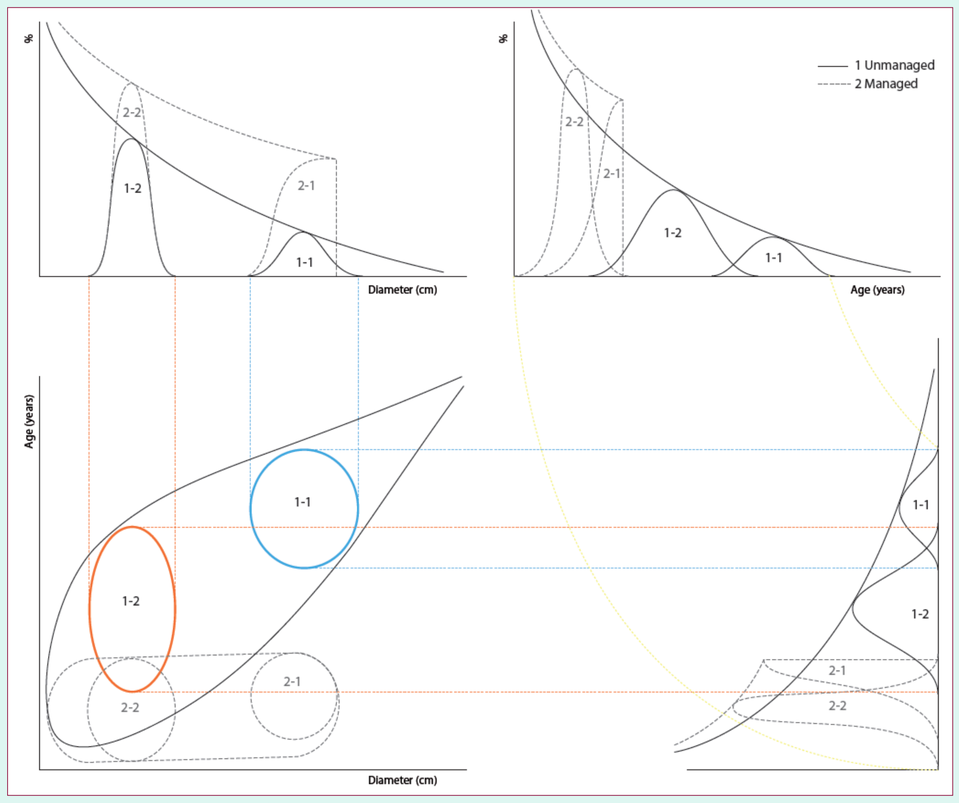

fig. 2b Models for diameter selection

Introduction and models

Woodland management (the intentional and long-term cutting of branches to improve quantity and quality of wood) such as pollarding and coppicing, is often discussed in North-western European archaeology (e.g. Christensen 1997; Rackham 2006; Rasmussen 1990). The main assumption is that branches in managed trees have better access to light and experience less competition than in unmanaged trees, resulting in accelerated growth, long straight branches and increased wood production.
While there is historical evidence from written sources and paintings, it is less clear whether it was practiced in Prehistory (see also Bernard et al. 2006; Billamboz 2003; Coles 1987; Haneca et al. 2005).

One way to recognise woodland management is by the analysis of the diameter and age of branch wood (Morgan 1988). This method is relatively easy to apply to branches which are regularly found at excavations (*fig. 1*). Management is however more often suggested than demonstrated, interpretation of data is often based on assumptions and the difference with diameter selection is not always clear. **To validate and clarify the method, models for unmanaged and managed wood were developed and tested with modern-day data**.

Figure 2a shows the age and diameter of branches available in **unmanaged wood (model 1)** and **managed wood (model 2)**. The latter predicts a clear maximum age. In *figure 2b* two different **diameter selections** are presented in these models. The shape of the age and diameter distributions will depend on the size of the branches collected. When selecting the largest branches from managed trees (**model 2.1**), the age distribution will end abruptly and is narrower than that of unmanaged trees (**model 1.1**).

fig.3 Working on modern-day coppiced ash, Horsten, the Netherlands

Modern-day trees study: example willow

The study compared branch age and diameter of modern-day trees of **alder** (*Alnus*), **ash** (*Fraxinus excelsior*) and **willow** (*Salix*) in the Netherlands and Denmark. The location and management method (coppicing and pollarding) varied between the trees. The diameter and the age were established at every meter for all branches and side-branches ≤6 cm diameter and ≥1m long (*fig. 3*). More information on the method and results will be provided in Out *et al*. (in prep.)

Figure 4 shows the diameter distribution, age distribution, and age/diameter scatter plot of unmanaged and managed willows. The pattern of the diameter distribution differs from the model. The age distribution of managed wood ends abruptly as predicted. The scatter plot shows large overlap in the small diameters, but as the diameter increases the **distinction between unmanaged and managed wood is possible.**

Results of ash and alder are less clear so far. Especially in alder the year rings are difficult to determine because of false and/or lacking year rings.

fig. 4 Data of managed and unmanaged willow

Application to archaeological data: two examples

Figure 5a shows the data of 25 fish traps from **Late-Neolithic Emmeloord-J97** (Van Rijn 2002) made of willow, plotted in the modern-day willow data. Since it concerns young, thin branches, age/diameter analysis does not allow conclusions about management, but **diameter selection** is clear, as was already concluded by van Rijn.

Figure 5b shows a selection of data of willow and hazel (*Corylus avellana*) wickerwork in **Early medieval Coppergate**, York, kindly made available by Dr. A. Hall, plotted in the modern-day willow data. As concluded (Hall & Kenward 2004), the willow comes from **unmanaged trees**. The willow branches have been **selected for their diameter**. The results of hazel seem to point exceptionally to **managed trees**, but modern-day hazel has still to be examined.

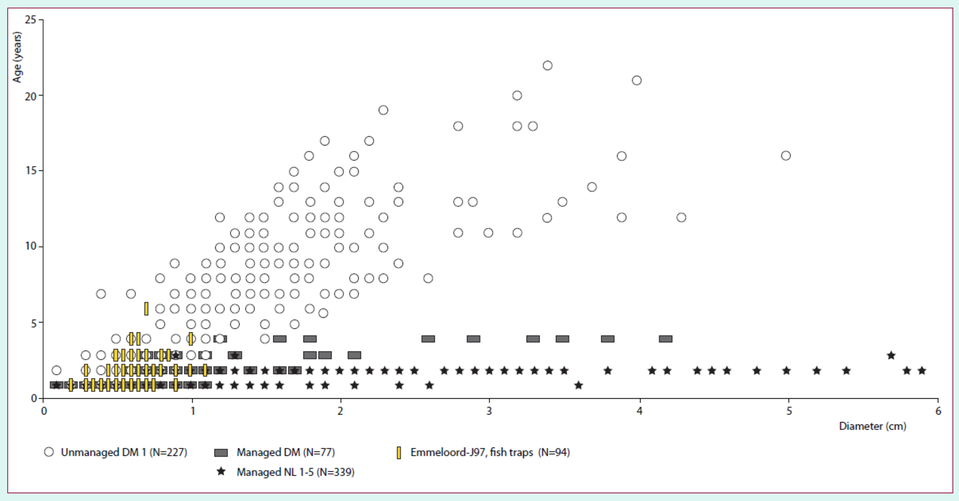

fig. 5a Willow from Late Neolithic Emmeloord (van Rijn) plotted in modern-day willow data

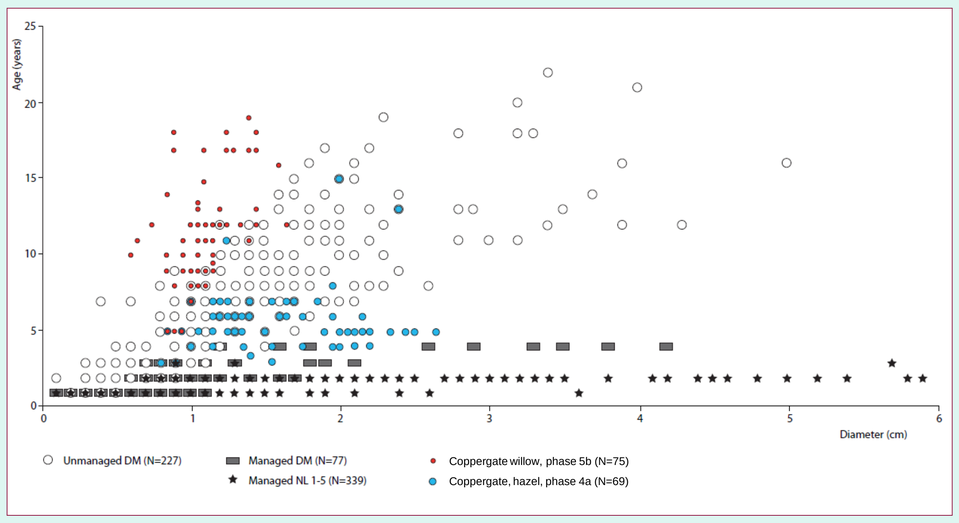

fig. 5b Willow and hazel from Early Medieval Coppergate (Hall) plotted in modern-day willow data

Figures: J. Porck

Conclusions

The modern-day data confirm the models for the age distribution and the age/diameter scatter plot: **distinction is possible between managed and unmanaged wood.** The pattern is clearest in the scatter plot, small diameters excluded. These differences are best revealed in archaeological datasets with large sample sizes, plotted per taxon (N≥100) with diameters >2 cm.
Large, narrow peaks in archaeological age/diameter datasets may often be explained by diameter selection.

Strong evidence of management by age/diameter analysis at archaeological sites in North-western Europe seems scarce. Most data come from small diameters and therefore conclusions cannot be drawn. Physical evidence, such as large numbers of long straight branches and heels, is however regularly found in British excavations.

Topics for future research are the validity of the models for other taxa (such as hazel) and larger diameters, as well as the age/diameter characteristics of naturally disturbed trees.

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