

1. Introduction to Dendrochronology

The Dendrochronology Research Framework for Scotland is the first in a series of updates to the Science section of the original ScARF national framework which was completed in 2012. During the development of the regional archaeological research frameworks, it became clear that updating parts of the Science Framework would be better dealt with at a national level rather than through the regional projects. This new dedicated research framework for dendrochronology allows a more complete consideration of its use and is designed to provide better support for this field of scientific dating in Scotland's cultural heritage sphere.

Dendrochronology has many applications both within and beyond cultural heritage, and this Research Framework embraces the wider applications of tree-ring science to include sections on dendroclimatology, dendroecology and dendro-isotopes as well as sections on dendrochronology in archaeology, standing buildings and landscape history. It covers the applications of both established and more novel approaches. A wide range of clients and researchers can benefit from the application of dendrochronology in their projects, whether in cultural heritage or environmental fields of interest.



Coppiced ash
tree on old
boundary of
Barhill Wood,
Kirkcudbright ©
Peter Quelch
for
Dendrochronicle

Conventional ring-width dendrochronology will continue to meet the needs of many cultural heritage projects for precision dating and dendro-provenancing purposes. In many cases dendrochronology can provide a felling date to a specific year, while the timber-provenancing information is produced by the same analytical process as dating, identifying the region with which the ring-width data match most closely (Haneca et al [2005](#); Daly [2007](#); Daly & Tyers [2022](#)) and is most feasible for oak and pine samples. Timber provenance is very important in Scotland because it has a long history of timber importation and dendrochronology can provide date, source and species information which contributes to our understanding of timber trade history. This evidence is also important in informing like-for-like replacement in repair work, for example. In addition, newer dendrochronological methodologies first developed for climate-based applications, for example using stable oxygen isotopes or Blue Intensity (BI) parameters, offer complementary approaches that broaden the range of material which can be dated and assist in expanding reference chronologies. They too, of course, offer advances in dendroclimatological applications.

This Research Framework is not a methodological guide, and readers are referred to other published sources of information on methods. In cultural heritage dendrochronology the [English Heritage](#)

Dendrochronology Guidelines (English Heritage 1998) remain a key reference which prospective users should consult.



A tree
corer still
embedded
in an oak
tree after
collecting
a sample
© Tom
Ovenden

To better understand how dendrochronology can be applied in practice the following important points, which are explored more thoroughly in this framework, should be highlighted :

multiple samples are usually needed for dendrochronology, for example, the English Heritage (EH) guidance advises a minimum of 8-10 related samples for dating each phase of a structure, while for climate applications 20-30 samples may be required;

fewer samples may be required for stable isotope dating techniques, but in such applications, results are best considered within the wider context of the entire sampled assemblage.

the majority of dendrochronology in Scotland is conducted on oak or Scots pine, but other suitable species such as elm and ash may sometimes be dateable. Although they cannot be calendrically dated, some other common species such as alder and hazel can provide important site-specific chronological information.

it is not the size of a timber that matters in terms of dating potential, it is the ring count and the status of the outer edge, as well as the species. The best results are obtained with series comprising many rings, but the emerging new methods using isotopes and BI can sometimes work with lower ring counts.

a dendrochronologist should be involved from the earliest stages of a project to advise on approach, to take or select suitable samples and to assess their dating potential. The field is developing rapidly so consult a dendrochronologist if you have any questions.

This Research Framework briefly summarises the range of uses and applications of dendrochronology in Scotland. Each section highlights recent developments and areas of good practice, followed by a number of key research questions and recommendations that should help guide the future development and application of dendrochronology in Scotland in the future.

2. Principles of Dendrochronology

3. Dendrochronology in Buried Archaeology

4. Dendrochronology in Buildings

5. Dendrochronology and Woodland History

6. Dendroclimatology

7. Dendroecology

8. Isotope Dendrochronology

9. Bibliography