# A dendrochronological analysis at Rassal Ashwood NNR, Wester Ross

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## Executive summary

An opportunity arose, through work on an undergraduate dissertation by Tom Cooper, to access core and disk samples from living and recently fallen ash (*Fraxinus excelsior* L.) trees at Rassal Ashwood National Nature Reserve. Dendrochronological analysis of these samples, reported here, was undertaken to complement the research undertaken by TC. This is also an opportunity to examine, with more data, the conclusions drawn by George Peterken (1986) regarding the age and origins of the woodland.

Dendrochronology offers the ability to provide absolute calendrical dates to dead samples as well as living tree samples. It may also reveal information about site management history, environmental influences, anthropogenic effects and stand dynamics. While ash is not known for its climatic signal in the UK, the extreme location of this ash stand wrt its range in Britain, and its situation on limestone, raised the possibility that Rassal ash trees could be sensitive to certain aspects of climate. However, a dendroclimatological analysis of the relationship between the site ring-width chronology and instrument records of temperature and precipitation revealed no significant correlation (Rob Wilson pers comm.). Despite this, there is a sufficiently well-replicated chronology, after 1851, to identify common good or bad years for tree growth across the woodland, which must reflect site-wide influences on growth including climate. Good growth years occur in 1870; 1882; 1929; 1933; 1947; and 1982. Bad growth years occur in: 1902; 1922; 1949; 1964; and 1988.

The dendrochronological analysis has resulted in 31 of the 34 analysed trees being correlated and dated, to form a site chronology spanning AD1789-2009. This is by far the best replicated ash chronology for Scotland, although not the longest, with late 17th Century living ash found at Loch Katrine (Mills *et al* 2009). The oldest tree sampled at Rassal originated in the earlier part of the 18th century, but rot precluded measurement of rings before AD1789. This tree may be a survivor of an earlier generation, a seed source for the late 18th and early 19th century origin ash trees which dominate Rassal today. Two older trees occur in the NW corner of the woodland, while the late 18th/early 19th century generation largely conforms to an eastern enclosure shown on the 1st edition OS map, separate from a smaller western enclosure. The western area, with the oldest trees, could be the location of the old burial ground, recorded in local oral tradition as the place where mineworkers and parish suicides were buried. Respect for this place may have caused it to be excluded from the economically-driven enclosure and regeneration of the eastern portion of the woodland from the late 18th century, when the Napoleonic Wars boosted the value of home-produced timber and charcoal. Given there were local tenants at Rassal into the 19th century, it is likely that a balance was struck between woodland productivity and the needs of subsistence farming until the clearances of the 1840s. No link between the woodland's history and the 18th century working of the nearby historic copper mine is evident; it appears these estate assets were managed separately. However, in-depth documentary research, especially of the estate papers, is needed to flesh out these aspects of site history.

The late 18th to early 19th century ash cohort has now become susceptible to death, seemingly by storm throw, with deaths evident in at least 9 different years since1995 for trees between about 175 and 225 years old. While this is a cause for concern given the mature, rather even-aged nature of much of the woodland, and the increased storminess expected with climate change, the results also provide valuable insights into the deadwood recruitment cycle.

There is no tree-ring evidence for formal pollarding of the Rassal ash, even for trees scored highly by TC on a pollard-form scoring system. Where branches have been aged, they are 19th or 20th century in origin, and again provide no evidence of a formal pollard regime. The results do not preclude less formal, *ad hoc* cutting. There is evidence for early grazing damage on some 19th century trees, with multiple shoots having fused into a single stem early in the life of several trees. Thus Peterken's (1986) views on the likely age and origins of this woodland are largely borne out by the results.

A single core from one of the single-stemmed old hazel trees indicated an origin in the first quarter of the 20th Century. The long, sensitive sequence points to excellent potential for the dendrochronological analysis of hazel in Scotland.

The site history and environmental influences at play in shaping the age, forms and growth rates of the trees are explored further in a GIS analysis in TC's dissertation; ultimately the aim is a joint publication on the key outcomes. The site chronology and age data provide a legacy which will assist future research and management at Rassal and which have wider applications for research into the history, ecology and management of Scottish native woodlands