

---

# Kingwater

## Highlights

Kingwater has yielded the best example of *in situ* arborescent pteridosperm stumps in the Lower Carboniferous of Britain, and provides important information as to the size, palaeoecology and density of this type of vegetation.

## Introduction

This Viséan site lies in the bed of Kingwater Beck, 4 km north-west of Gilsland, near Haltwistle, Cumbria [NY 608 697]. *In situ* fossil tree stumps were discovered here by Day (1970), and described in detail by Long (1979a).

## Description

### Stratigraphy

The geology of this site was described by Day (1970). The stumps occur just below the Desoglin Limestone, near the top of the Middle Border Group (Figure 5.21). Fossil marine invertebrates and algae from near this horizon indicate the S<sub>1</sub> Zone, which in modern terms places it in the Arundian Stage. The deposits probably represent a fluvial environment, although detailed sedimentological information is not available.

### Palaeobotany

Ten *in situ* stumps found here have been identified as *Pitus primaeva* Witham. The largest is just under 2.5 metres in diameter, and evidently belonged to a tree of considerable size, perhaps 10 metres or more in height. The spacing between the stumps varies from 4 to 40 metres. However, this variation may be partially the result of some stumps being no longer preserved, due to their removal either immediately after death or by recent erosion.

Such examples of a forest floor with surviving *in situ* stumps dating from the Early Carboniferous are rare worldwide, and this is the only one presently available showing a stand of gymnosperm trees.

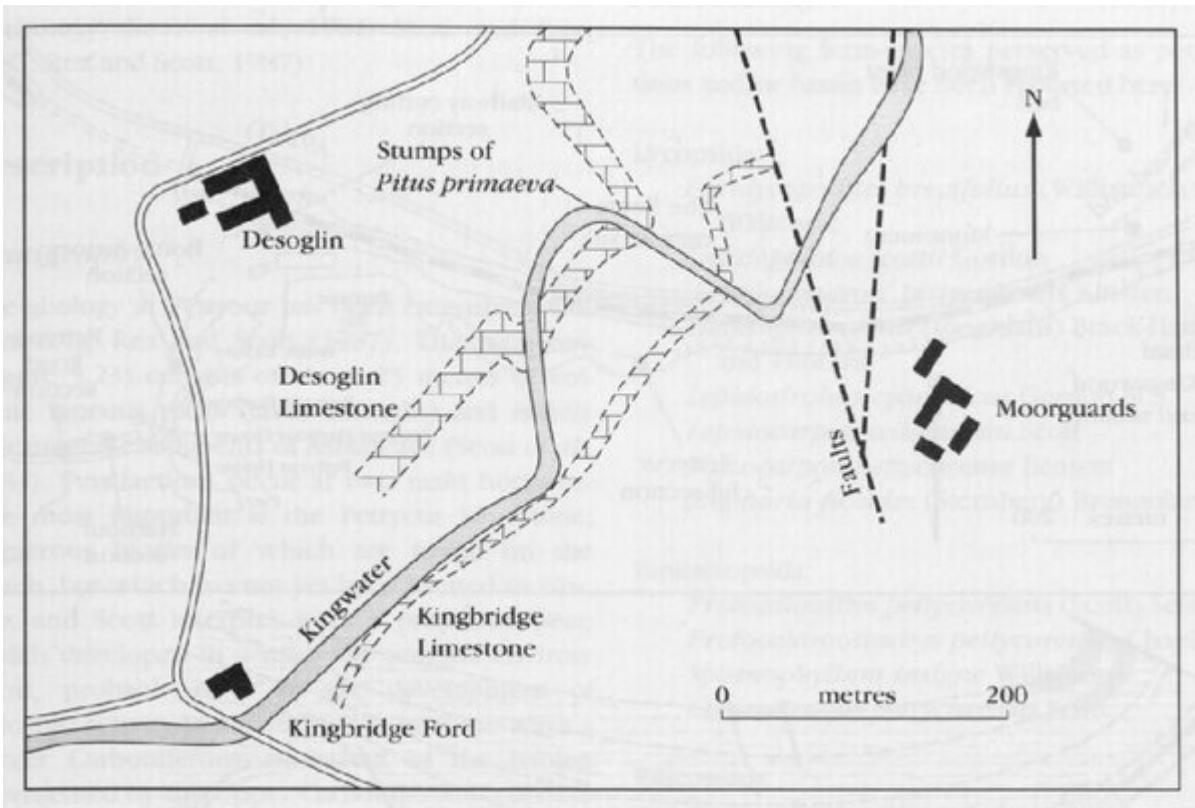
## Interpretation

Based on the fossils present, it can be calculated that there must have been at least 2000 trees per km<sup>2</sup> in this area, indicating an open woodland environment. According to Long (1979a), they grew at sufficiently low altitudes for them to have become flooded and buried by marine deposits.

## Conclusion

Kingwater has the only known examples of gymnosperm tree-stumps, still preserved in position, from about 340 million years ago. They provide a valuable insight into the nature of these very early forests, that pre-dated by some 30 million years the tropical coal-swamp forests that covered the palaeoequatorial belt (including Britain) in Late Carboniferous times.

## [References](#)



(Figure 5.21) Map of that part of Kingwater where in situ tree stumps are preserved in the Lower Carboniferous. Based on Day (1970, figure 20).