

Historical mapping reveals causes and temporal patterns of woodland contraction in Austur-Skaftafellssýsla from the 12th century AD to present

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Land-cover changes in Iceland over the last millennium encompass birch (*Betula pubescens*) woodland depletion and extensive soil erosion. Yet few studies have focused on spatial change of birch woodland coverage in Iceland over centuries and why and how the woodland depletion took place.

The main objectives of this study are: (1) to map the woodland distribution today in Austur-Skaftafellssýsla (3041 km²) in southern Iceland; (2) to map woodland holdings over a period of 900 years from eleventh. AD 1100 to the early 20th century; (3) explain the relative impacts of socio-economic and natural forces on woodland cover over this period. We use a combined approach of historical reconstruction from diverse written archives, GIS techniques and field work.

The woodland in Austur-Skaftafellssýsla now covers 73.2 km² (2.5% of the study area). The woodland holdings, 44 in total, are regularly listed in the church inventories from 1179 to 1570 and are owned by the church. In the first complete register for the district in 1641 the woodland holdings were 73, owned and used by 58 estates, and distributed across Austur-Skaftafellssýsla.

All the main patches of woodland remain today, with the exception of four minor woodlands which were exhausted near the end of the 19th century. The woodland was used for firewood and charcoal making as well as grazing during the study period but, crucially, in most cases only one estate had authority over each holding, none were commons. The main driving force behind the development of woodlands was socio-economic, rather than natural, where the form of ownership was fundamental for the fate of the woodland. Harsh climate and volcanism were not directly responsible for woodland depletion. The latter half of the 19th century was the period of greatest woodland loss. This period coincides with considerable expansion in livestock numbers, especially sheep and associated all year around grazing, at a time when the Little Ice Age culminated in Iceland.

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