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Soil fertility and commercial forest felling: research note

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In upland Britain, large areas of nutrient-poor, former sheep grazing land has been planted with Sitka spruce (*Picea sitchensis*). Many of these plantations will be clearfelled before the end of the century.

Clearfelling results in:

- i. changes in soil decomposer activity, because of changes in temperature and moisture regimes;
- ii. increases in material for decomposition (branches, etc);
- iii. cessation of nutrient uptake by roots.

Research around the world indicates that these processes may cause a significant loss of plant nutrients in drainage water, resulting in reduced soil fertility. There are, however, no published data for British forests.

To determine if the clearfelling of spruce plantations will have a significant impact on soil fertility, research is being conducted at Kershope Forest in Cumbria. Water is collected for analysis from 6 ditch systems, each of which drains a separate plot of approximately 2 ha. All plots are on a peaty gley soil which has never been fertilized and which was planted with Sitka spruce in 1948. Three plots have now been felled. Sampling began 2 years before felling was completed and continues at weekly intervals, on standing and felled plots.

Concentrations of all major nutrients increased following felling (relative to standing forest). These increases were compounded by increased drainage water discharge,

resulting from reduced evaporation caused by tree removal. Thus, the annual export of nutrients increased markedly, as a result of felling, although more data will be required to determine the impact on soil fertility.

	Annual export of nutrients (kg ha ⁻¹ yr ⁻¹)							
	1982		1983		1984		1985	
	C	E	C	E	C	E	C	E
Potassium	2.9	2.0	1.8	2.9	3.6	18.3	5.7	21.8
Phosphate-P	0	0	0.09	0.04	0.02	0.23	0.08	0.42
Nitrate-N	9.4	10.5	6.0	7.8	8.5	38.7	15.2	41.1
Ammonium-N	1.0	0.6	0.5	0.3	0.9	7.6	1.6	3.0

C, control plot; E, experimental plot where felling took place in 1983

Increased acidity of drainage water from commercial forests has been attributed to the trapping of atmospheric pollutants by the tree canopy. However, so far at Kershope, no reduction in acidity has been found as a result of tree felling. At no time did the concentration of nutrients in the drainage water exceed pollution standards.

To determine the sources of nutrient fluxes and likely effects on the next forest rotation, water is also sampled at all stages in its passage through the standing and felled forest systems (including 4 soil horizons).

This work forms part of a programme of field and laboratory work to determine the effects of felling on soil processes. A parallel site is at Beddgelert Forest in Gwynedd. Staff involved are from the Institute of Terrestrial Ecology's Merlewood and Bangor Research Stations and from the Forestry Commission research stations.