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FOREST DECLINE IN THE EAST OF FRANCE

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Two years ago, new forest decline became evident in the Vosges region. It spread and became more intensive during the summer 1984. At the end of 1984, 26 % of the white firs and 16 % of the Norway spruces had lost more than 20 % of their needles and many spruce stands were yellowing.

Different hypotheses are presented, mainly originating from german literature. The extent of the forest decline in all industrial countries of the northern hemisphere, the localisation of the most serious damage at the highest elevations and in open or two stories stands bear out the probability of an air pollutants effect : SO_2 and photooxydants. Lower Mg contents in fir needles, in Vosges as in Black Forest, were found in the most damaged stands (tabl. I), showing the possible validity of the theory of cations lixiviation by acid rain after damage to cuticles and cell walls by H_2SO_4 and O_3 (fig. 1).

The interaction between dry years (1959, 1976, 1983) and air pollution may have led to a gradual decline of physiological activity (fig. 1).

A moderate decline of the forest is not related with soil fertility, but it seems that the greatest damage is located in specific sites with poor ecological conditions such as poor parent material and very shallow or badly drained soils.

ULRICH's theory of aluminium toxicity is briefly presented (tabl. II, fig. 2). Although content of Al+++ in the soil solution rarely rises to the toxicity thresold, some attention is given to the very low exchangeable Ca and very high exchangeable Al contents of many soils in the Vosges region.

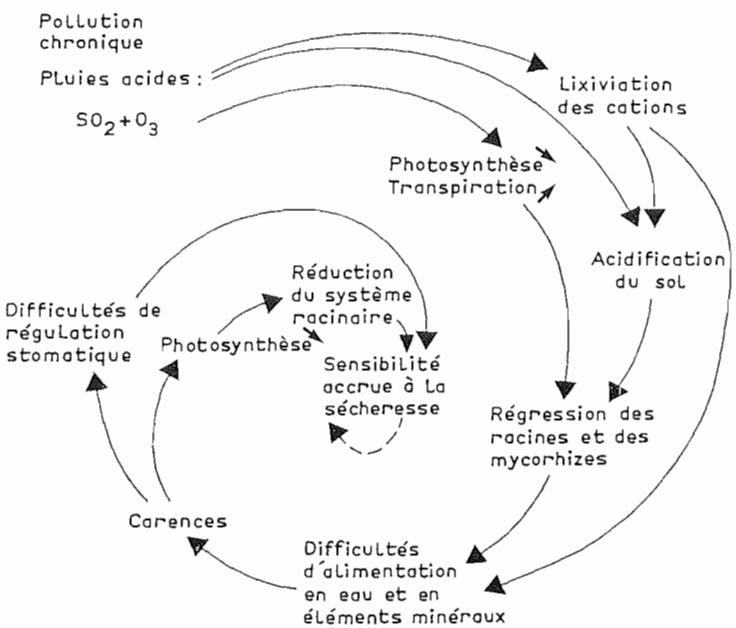

Figure 1 : Hypothetical schema of the progressive decline of forest stands.

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Table I : Concentrations of total elements in fir needles with respect to age and loss of needles (1 : loss 0 to 9 % of the needles ; 2. from 10 to 24 % ; 3a : from 25 to 39 % ; 2b : from 40 to 59 %).

Age des aiguilles	Classe de défoliation	N	P	K	Ca	Mg	S
1 an	1	1.35	0.18	0.72	0.39	0.11	0.11
	2	1.36	0.19	0.71	0.30	0.09	0.12
	3a	1.38	0.19	0.64	0.37	0.09	0.11
	3b	1.42	0.16	0.64	0.35	0.07	0.11
4 ans	1	1.40	0.11	0.51	0.60	0.06	0.13
	2	1.38	0.12	0.47	0.62	0.05	0.12
	3a	1.35	0.11	0.47	0.75	0.04	0.12
	3b	1.41	0.11	0.48	0.69	0.04	0.12