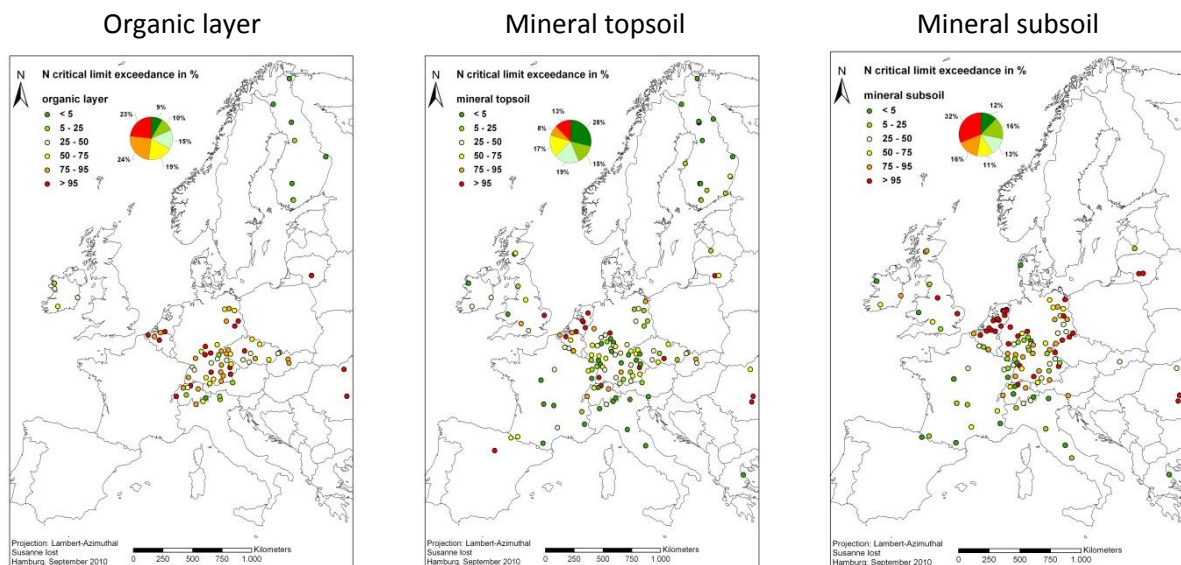


Critical Limits

Critical limits of soil solution element concentrations are important input parameters for the calculation of Critical Loads. They mark a threshold concentration above which adverse effects on the vegetation may occur. Critical Loads are defined as "a quantitative estimate of an exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge" ([ICP Modelling and Mapping](#)). Soil solution assessments at Level II plots were used to calculate exceedances of critical limits for N concentrations and [Mg + Ca + K]/Al ratio (Further information on methods in [Technical Report 2012](#).) In the case of N, nutrient imbalances, reduced root growth and enhanced sensitivity to frost and fungi are important effects of high N concentrations in the soil solution of the rooting zone. Increased leaching of N to ground and surface water bodies occurs if N concentrations below the rooting zone are higher than 1 mg per l. High Al concentrations in the soil solution may be toxic and are evaluated in relation to the sum of basic cations. The critical limit is tree species specific and ranges from 0.3 to 2. Single exceedance of Critical Limits will not lead to instant dieback but will cause higher sensitivity to natural stressors. The maps below show how often critical limits were exceeded during soil solution monitoring. The more often critical limits were exceeded the higher the probability that described adverse effects occur and of reduced vitality and growth of forest vegetation.

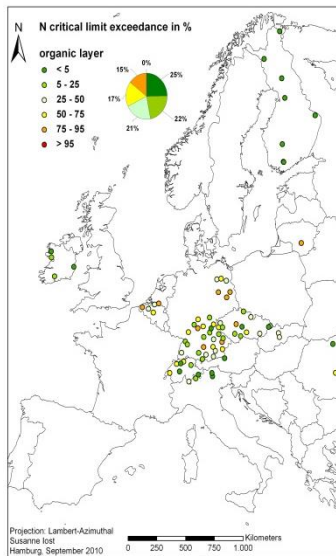
Further information and discussion of results are available in [FutMon Scientific Report](#)

Critical Limit Exceedances

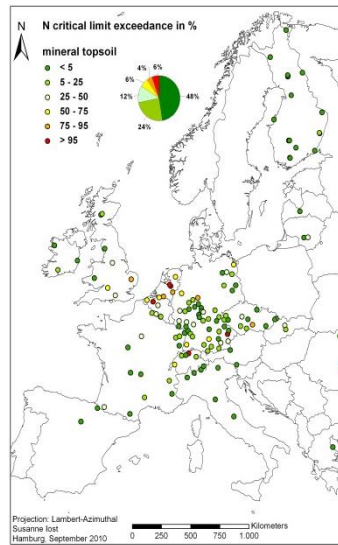


Frequency of N critical limit exceedances (CLimE) for nutrient imbalances in organic layers, mineral topsoils and mineral subsoils. Only plots with measurements in at least four consecutive years prior to 2006. Critical limits are >0.2 mgN/l for coniferous and >0.4 mgN/l for broadleaved forests. The colour of the plots display the proportion, e.g. <5% or ≥95%, of the measurements that have exceeded the CLimE (mean value per plot). The pie charts display the proportion of the plots that belong to the six categories.

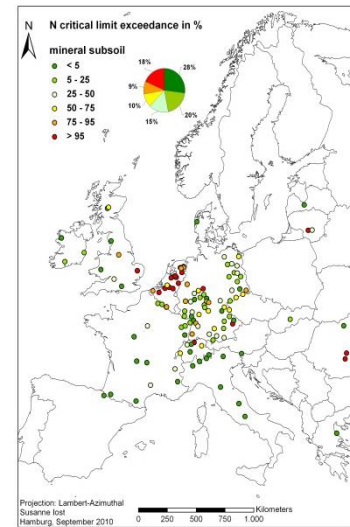
Organic layer



Mineral topsoil

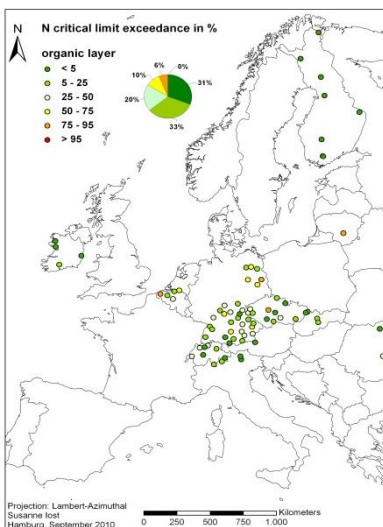


Mineral subsoil

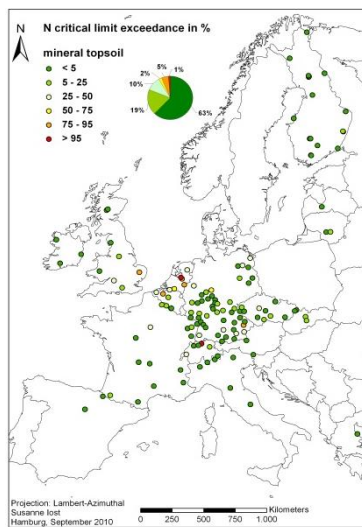


Frequency of N critical limit exceedances (CLImE) for N saturation / leaching in organic layers, mineral topsoils and mineral subsoils; Only plots with measurements in at least four consecutive years prior to 2006. The critical limit applied is $>1 \text{ mgN/}$

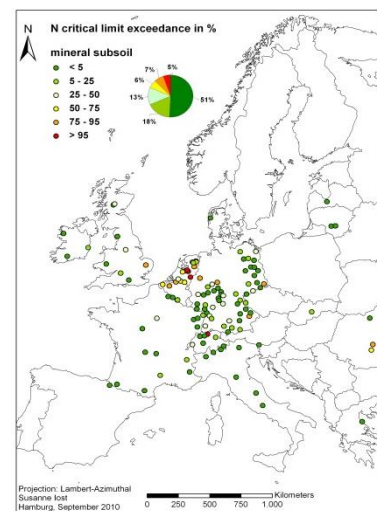
Organic layer



Mineral topsoil

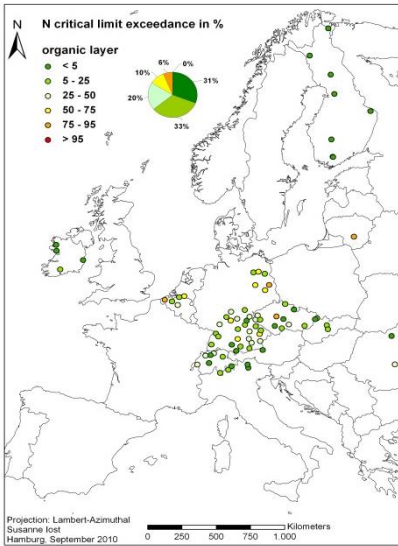


Mineral subsoil

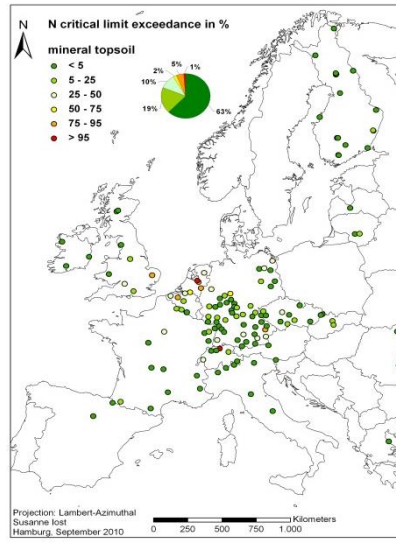


Frequency of N critical limit exceedances (CLImE) for reduced fine root growth in organic layers, mineral topsoils and mineral subsoils; Only plots with measurements in at least four consecutive years prior to 2006. The critical limit applied is $> 3 \text{ mgN/}$

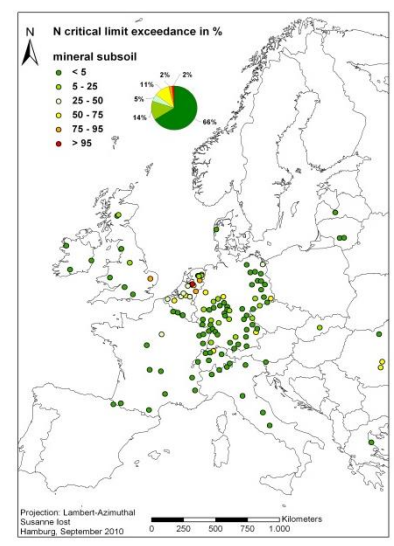
Organic layer



Mineral topsoil



Mineral subsoil



Frequency of N critical limit exceedances (CLImE) for enhanced sensitivity for frost and fungi in organic layers, mineral topsoils and mineral subsoils; The critical limit applied is > 5 mgN/l.