

# Recovery from N saturation in Flemish forests under high N deposition

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The objective of this study was to evaluate the recovery from nitrogen (N) saturation in forests under high N deposition in Flanders, northern Belgium. Deposition and soil solution concentrations of inorganic nitrogen (DIN) and total N were measured at five ICP Forests intensive monitoring plots (1 *Pinus sylvestris*, 1 *P. nigra* subsp. *laricio*, 2 *Fagus sylvatica* and 1 mixed *F. sylvatica* – *Quercus robur*) from 1996 till 2013 (DIN) and from 2005 till 2013 (total N). Deposition and soil solution concentrations of organic nitrogen (DON) were calculated as total N - DIN. The sodium mass balance approach was used to calculate N fluxes through the soil. In 1996 all forests were strongly N saturated, indicated by year-round elevated nitrate ( $\text{NO}_3^-$ ) leaching. Despite an overall decrease of DIN depositions, DIN + DON depositions still amounted to 22-32 kg N ha<sup>-1</sup> y<sup>-1</sup> in 2013. This coincided with a decline of  $\text{NO}_3^-$ -leaching, and an increase of the DON/DIN ratio in deposition and soil solution. Though, the recovery rates varied among the plots. In the two beech plots  $\text{NO}_3^-$ -leaching decreased rapidly around 2004. Coniferous plots showed a more gradual recovery, with actual  $\text{NO}_3^-$ -concentrations below 2 mg N l<sup>-1</sup> in the deeper mineral soil during most part of the year. Only the mixed oak-beech plot remained highly N saturated, probably due to elevated humus desintegration in the mineral topsoil. This study points out that chemical recovery of forest soil solution could also be expected under high N deposition, and that  $\text{NO}_3^-$ -leaching may cease rapidly when the retention capacity of the forest ecosystem is no longer exceeded.