

Nitrogen nutrition of *Picea abies* in a mountain forest ecosystem subjected to experimentally increased N deposition

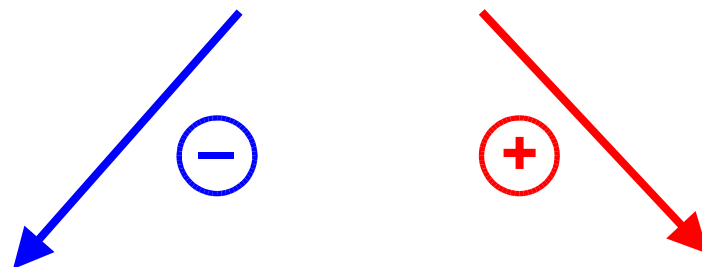
***P. Schleppi*¹, *I. Providoli*¹, *M. Saurer*² & *R. Siegwolf*²**

Swiss Fed. Institute for Forest, Snow and Landscape Research (WSL),
Zürcherstr. 111, CH-8903 Birmensdorf

Paul Scherrer Institute (PSI), CH-5232 Villigen

NITREX

Manipulation of N deposition



Alptal

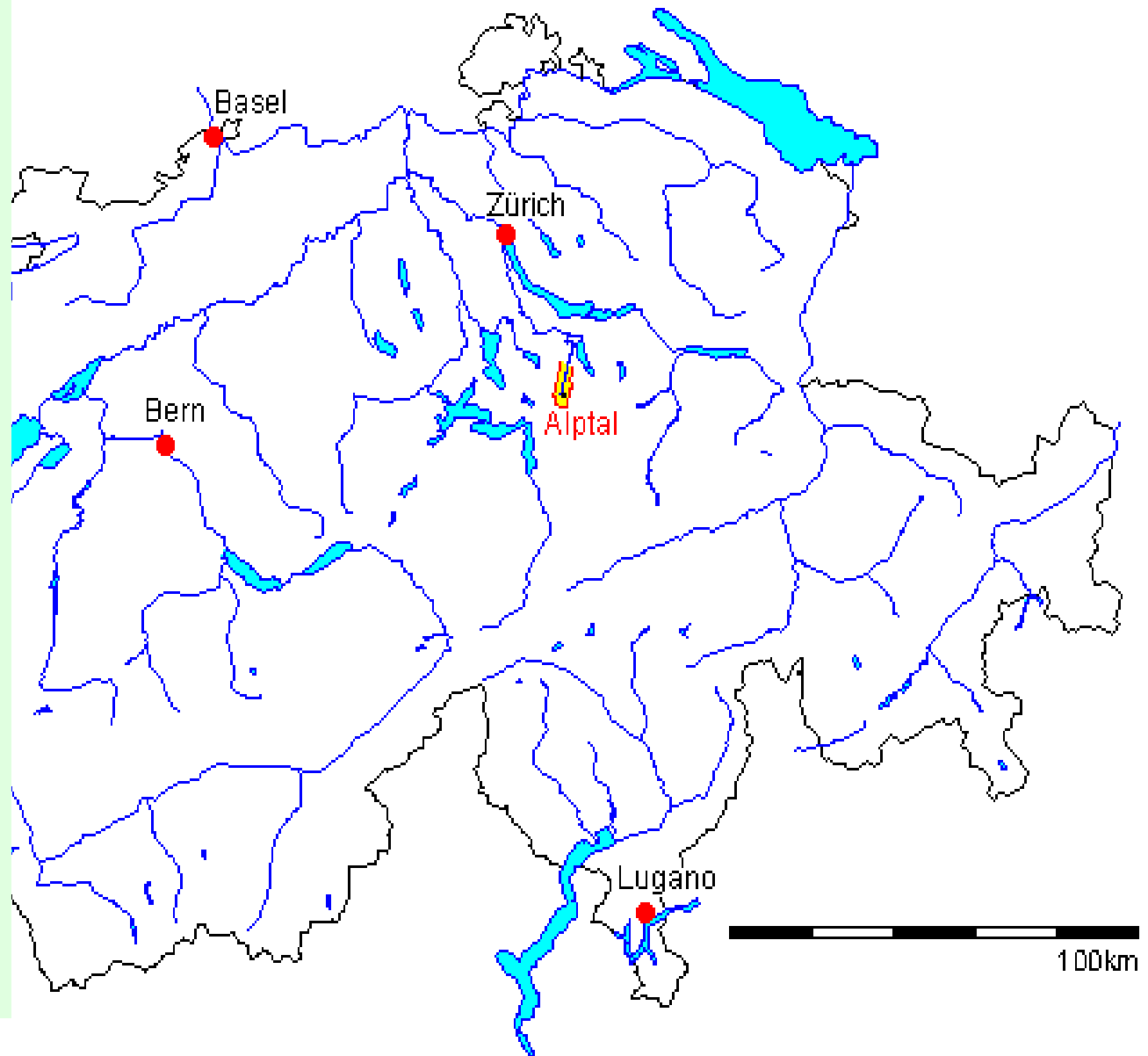
Altitude:
1200 m

Geology and soils:
Gleysol over Flysch

Vegetation:
mosaic of forest and
wetland patches

Precipitation:
2300 mm/a
(30% as snow)

Bulk N deposition:
12 kg/ha/a
($\text{NO}_3^- \cong \text{NH}_4^+$)







LF

Aa

Gor

Gr

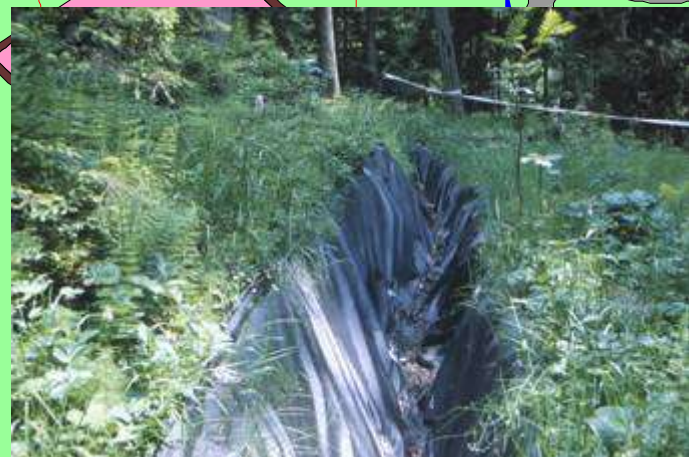


50 m

wetland

irrigation system

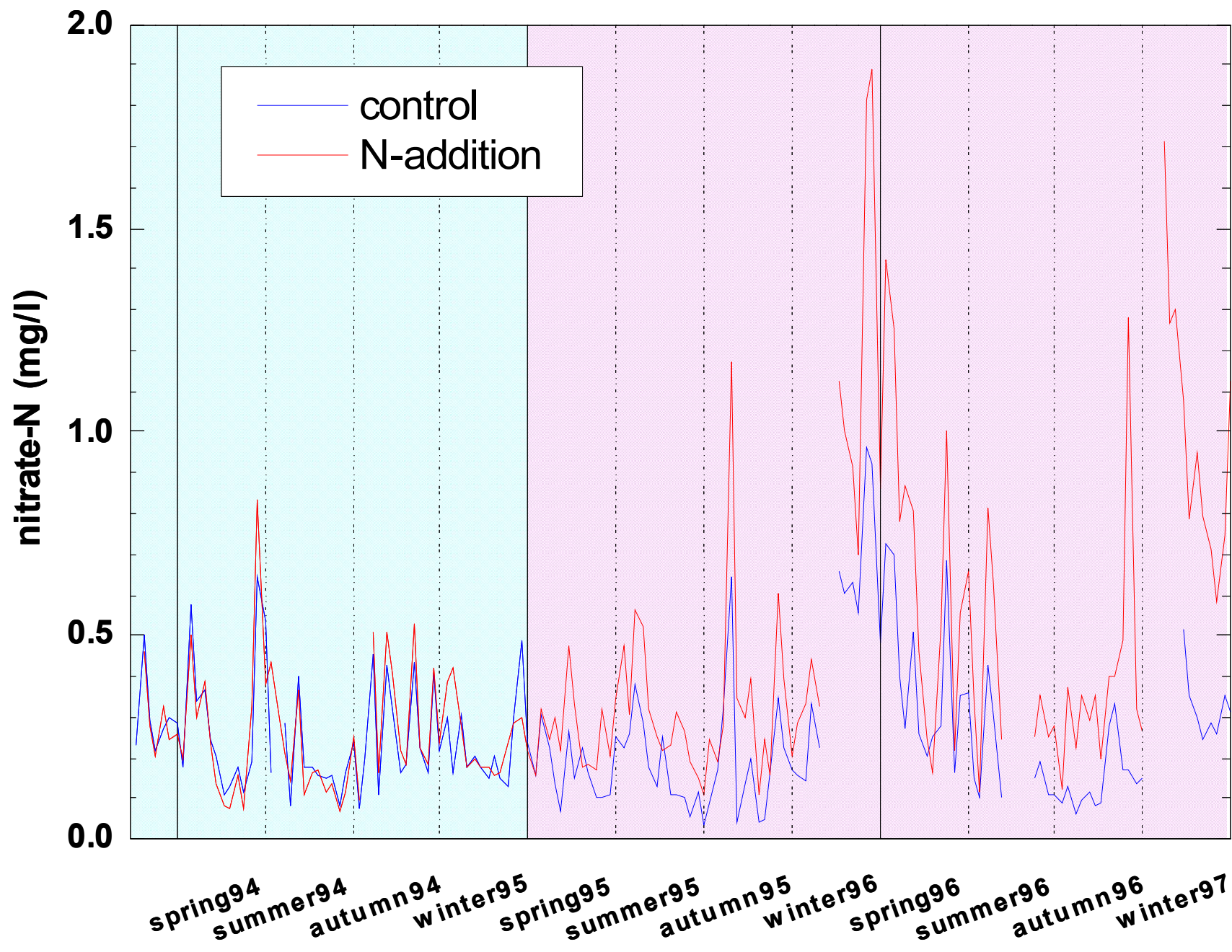
catchment 3
(wetland)



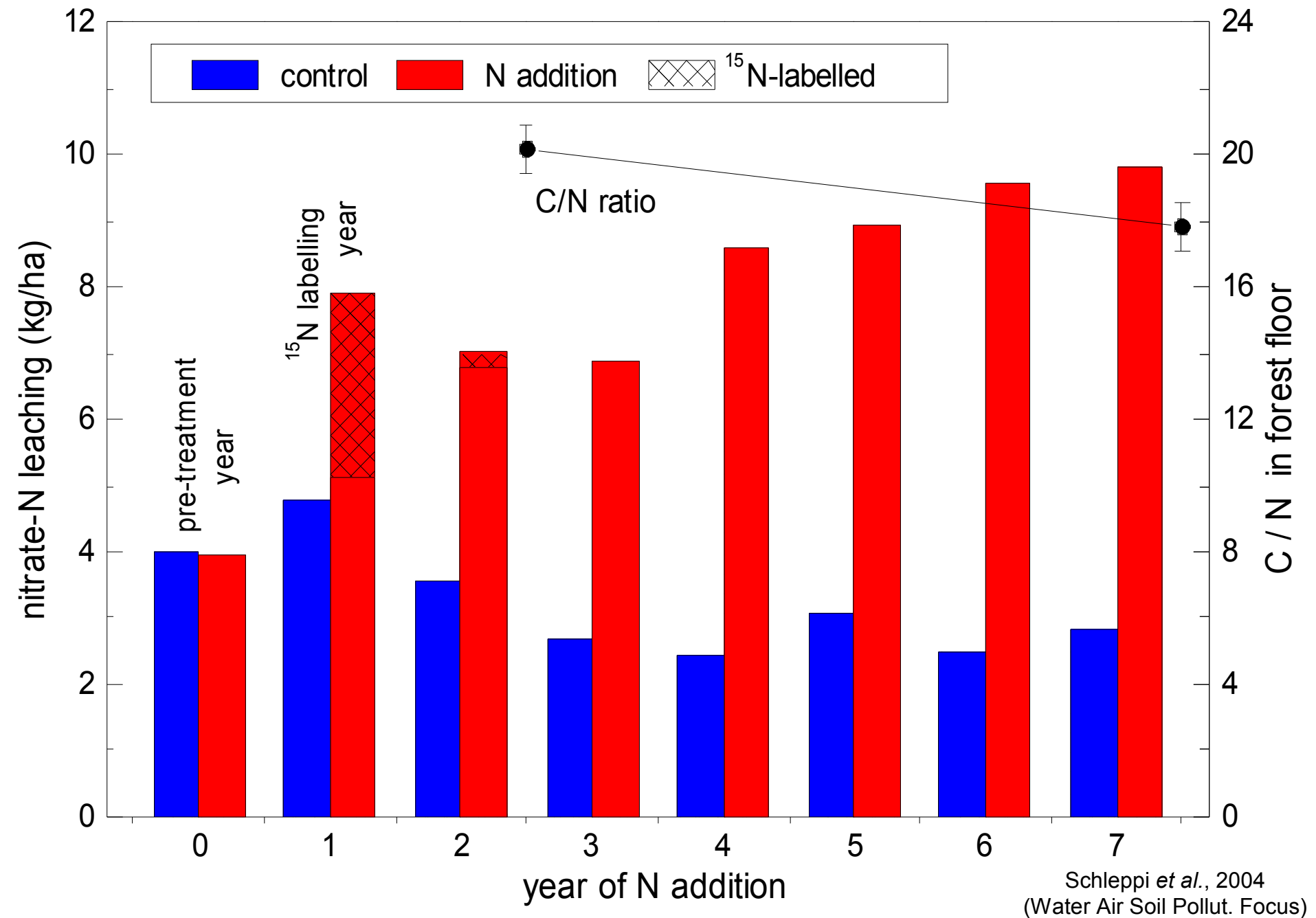
30m

30m

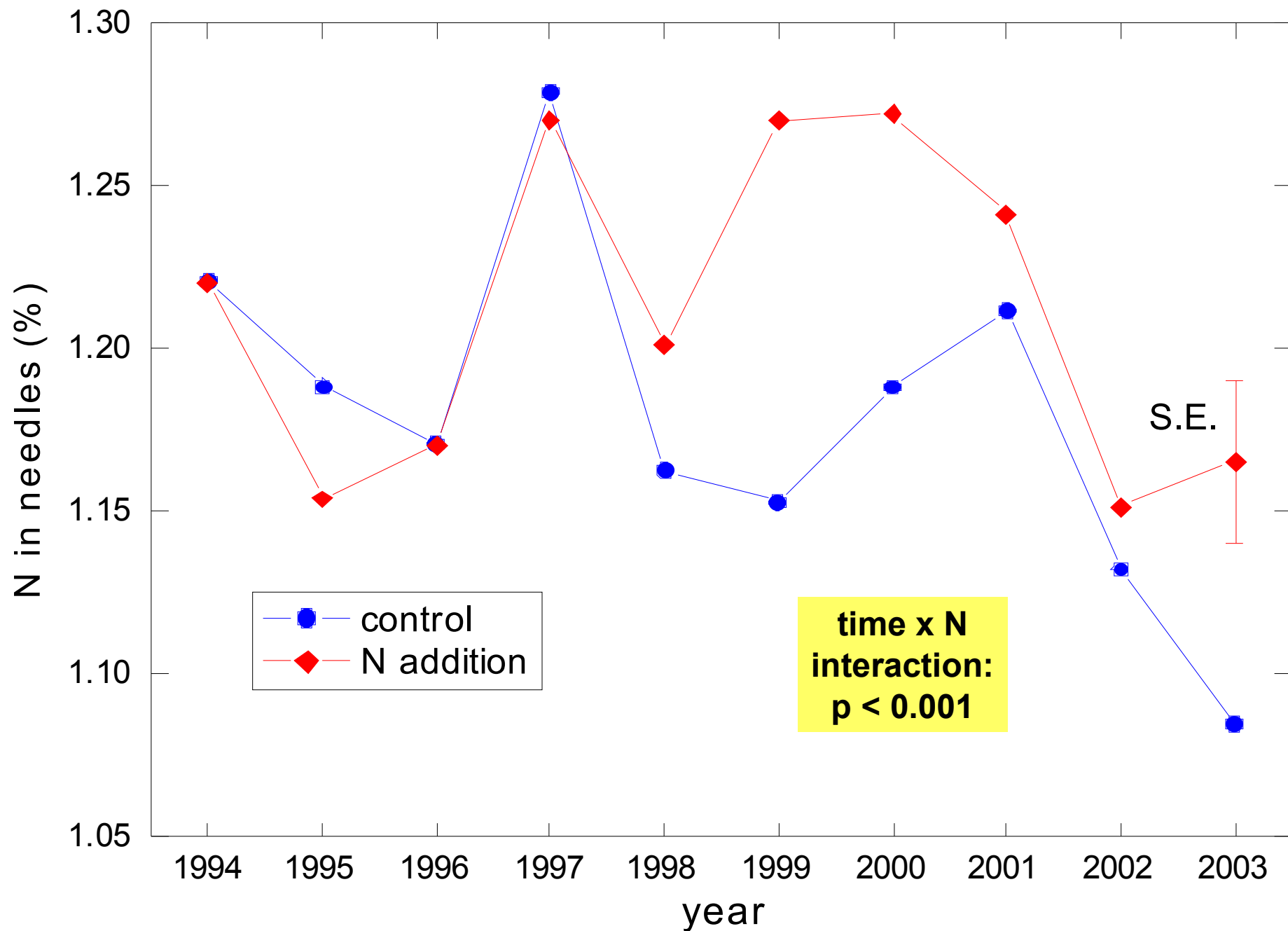
Nitrate leaching: weekly concentrations



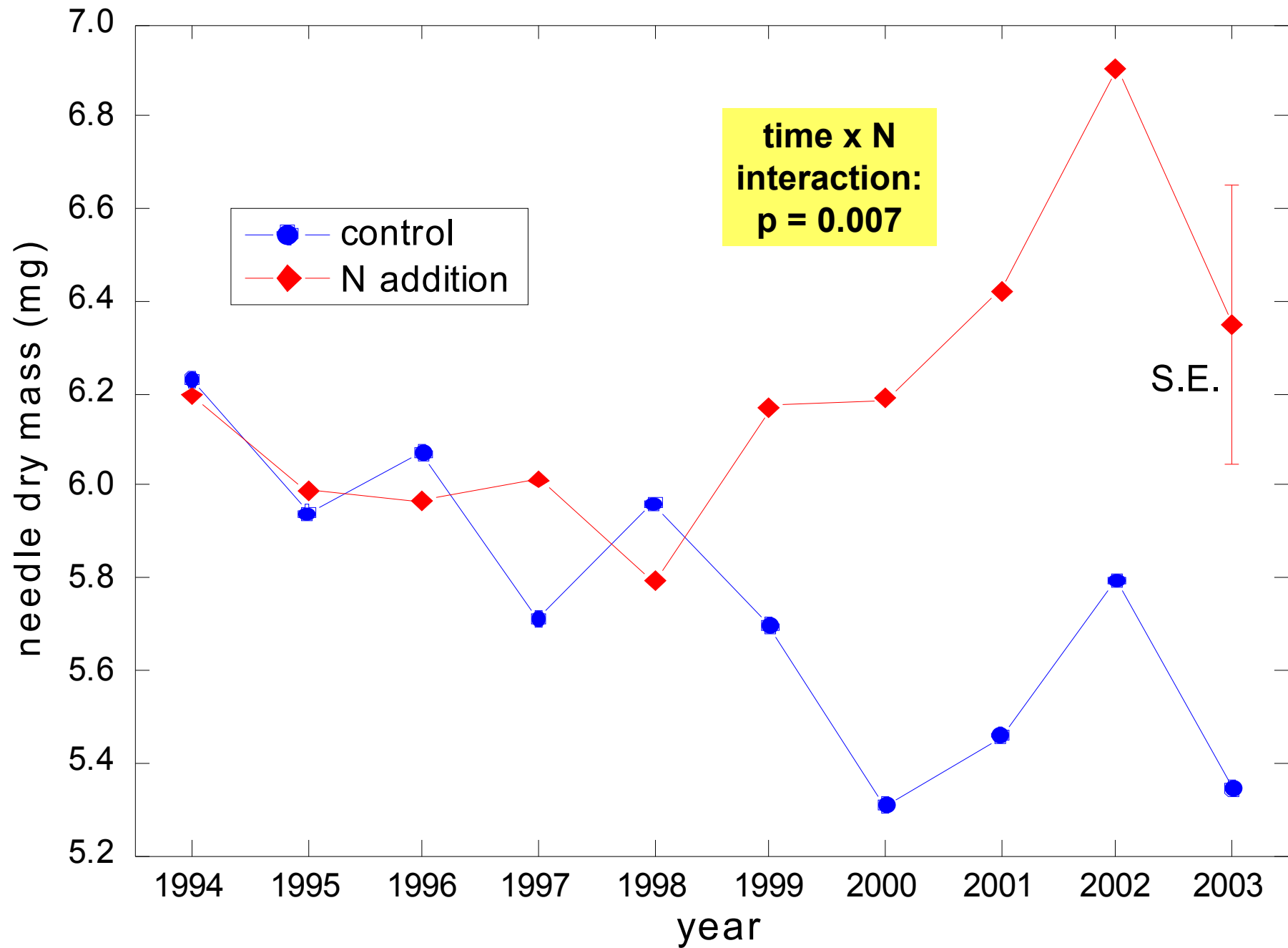
Nitrate leaching: long-term effects



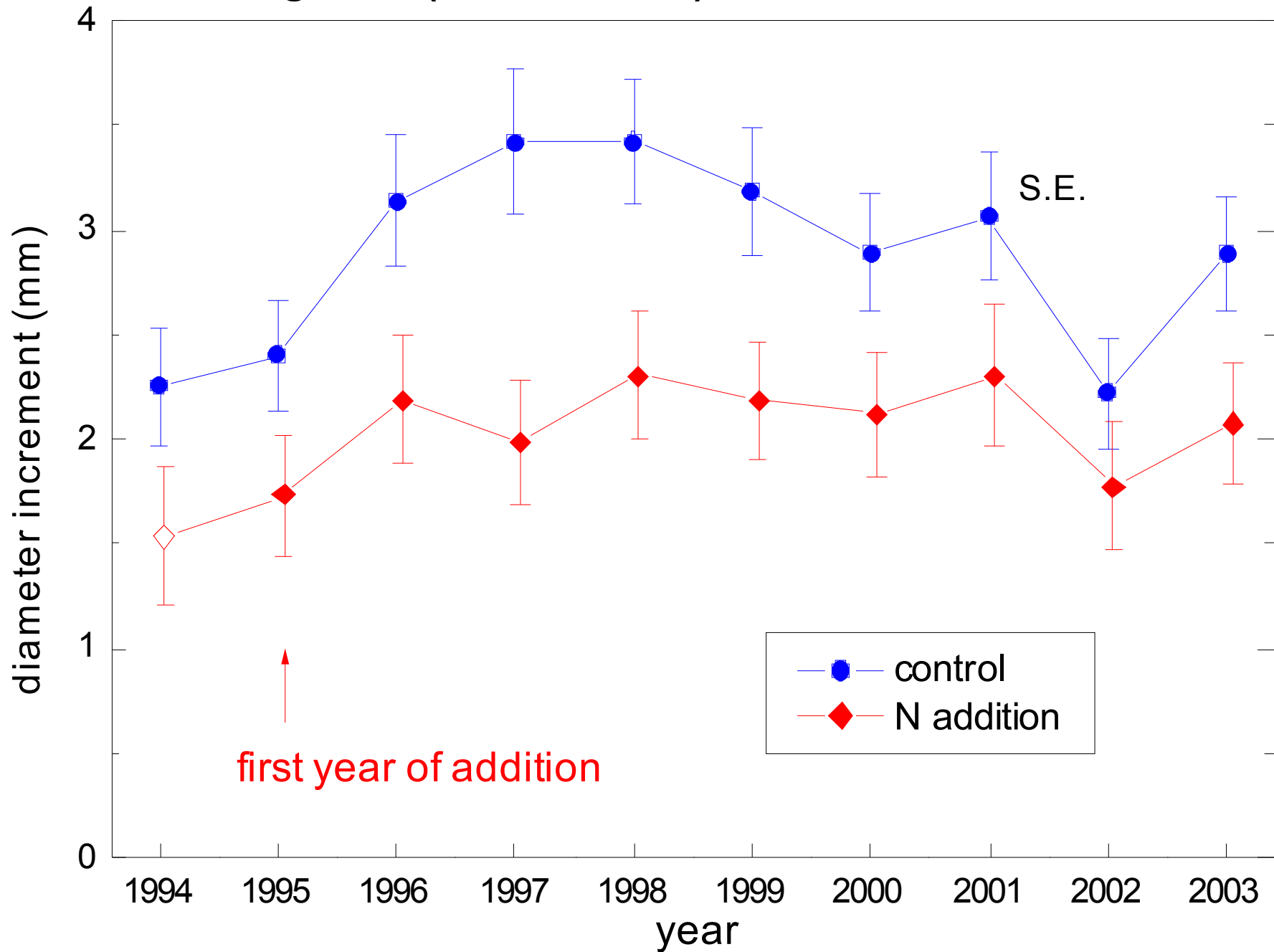
N concentration in needles



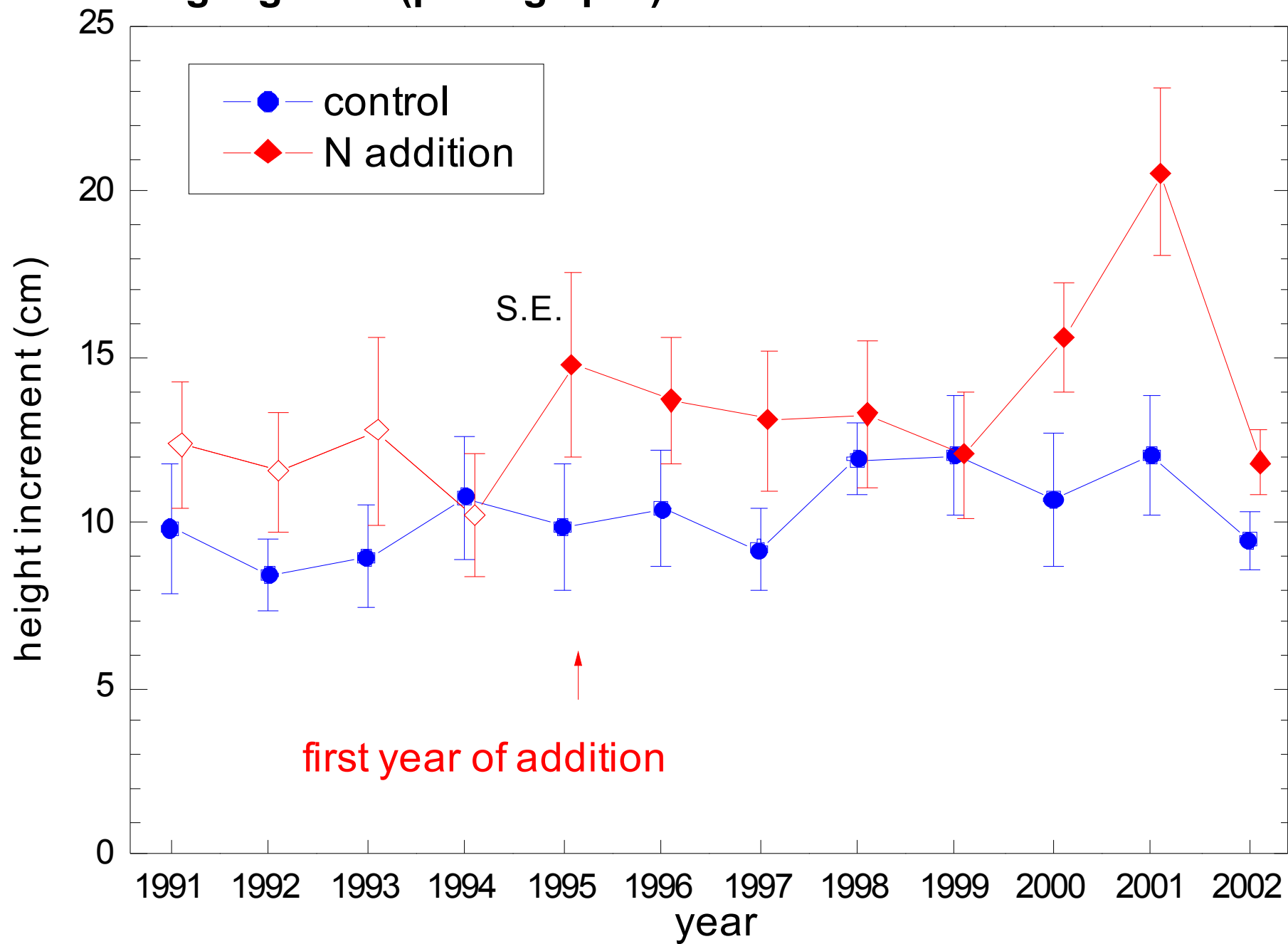
Needle dry mass



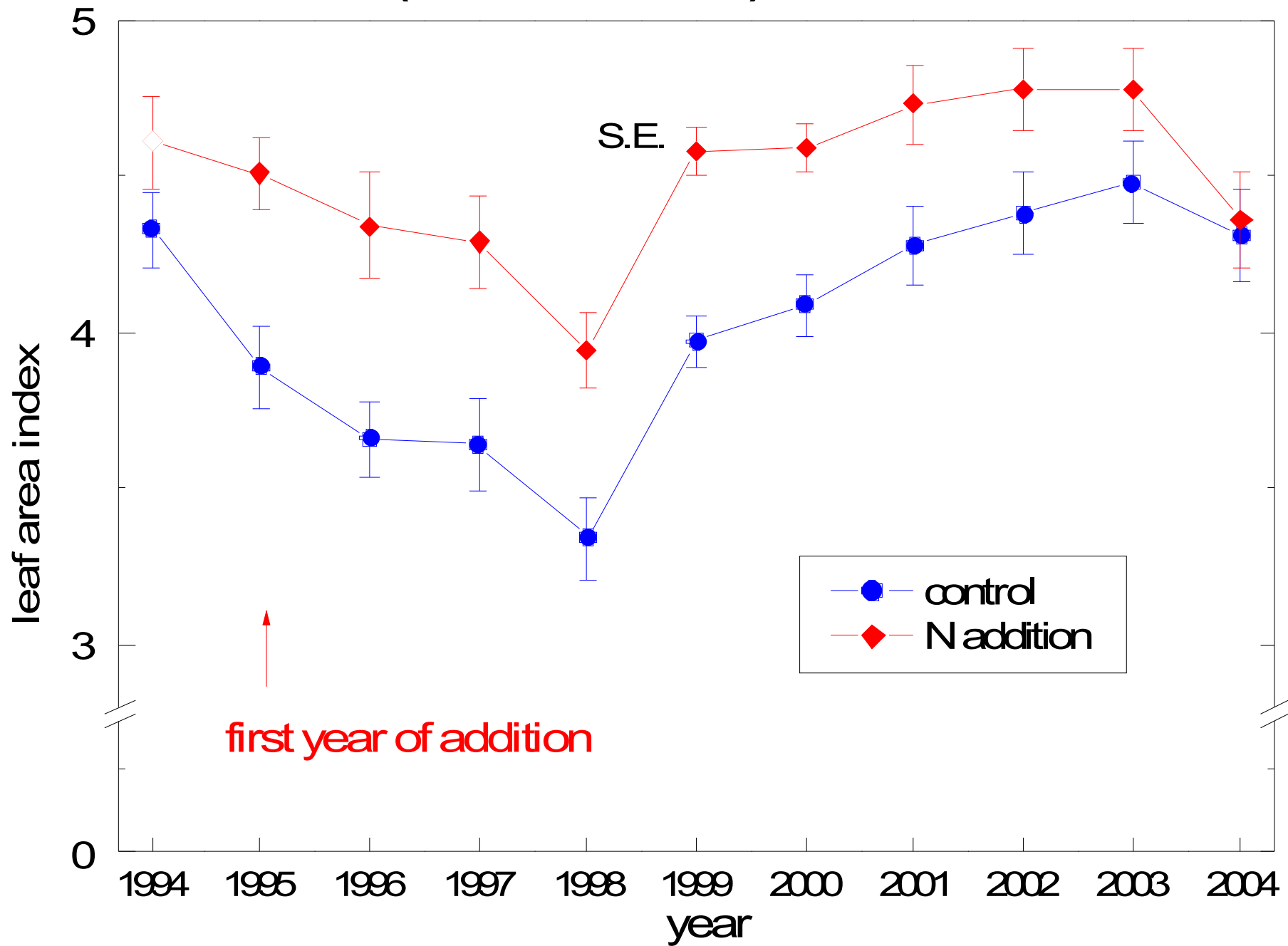
Diameter growth (dendrometers)



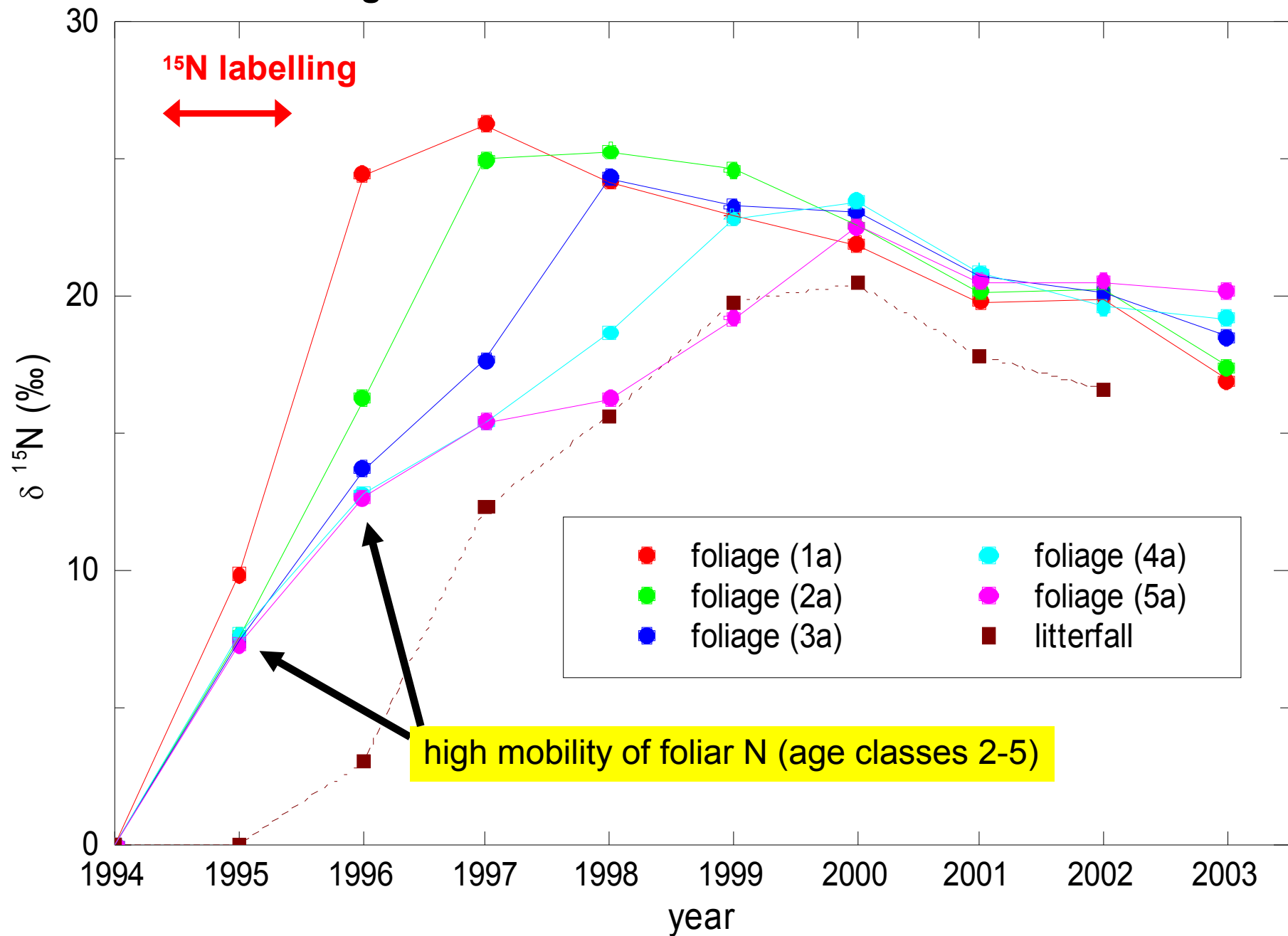
Height growth (photographs)



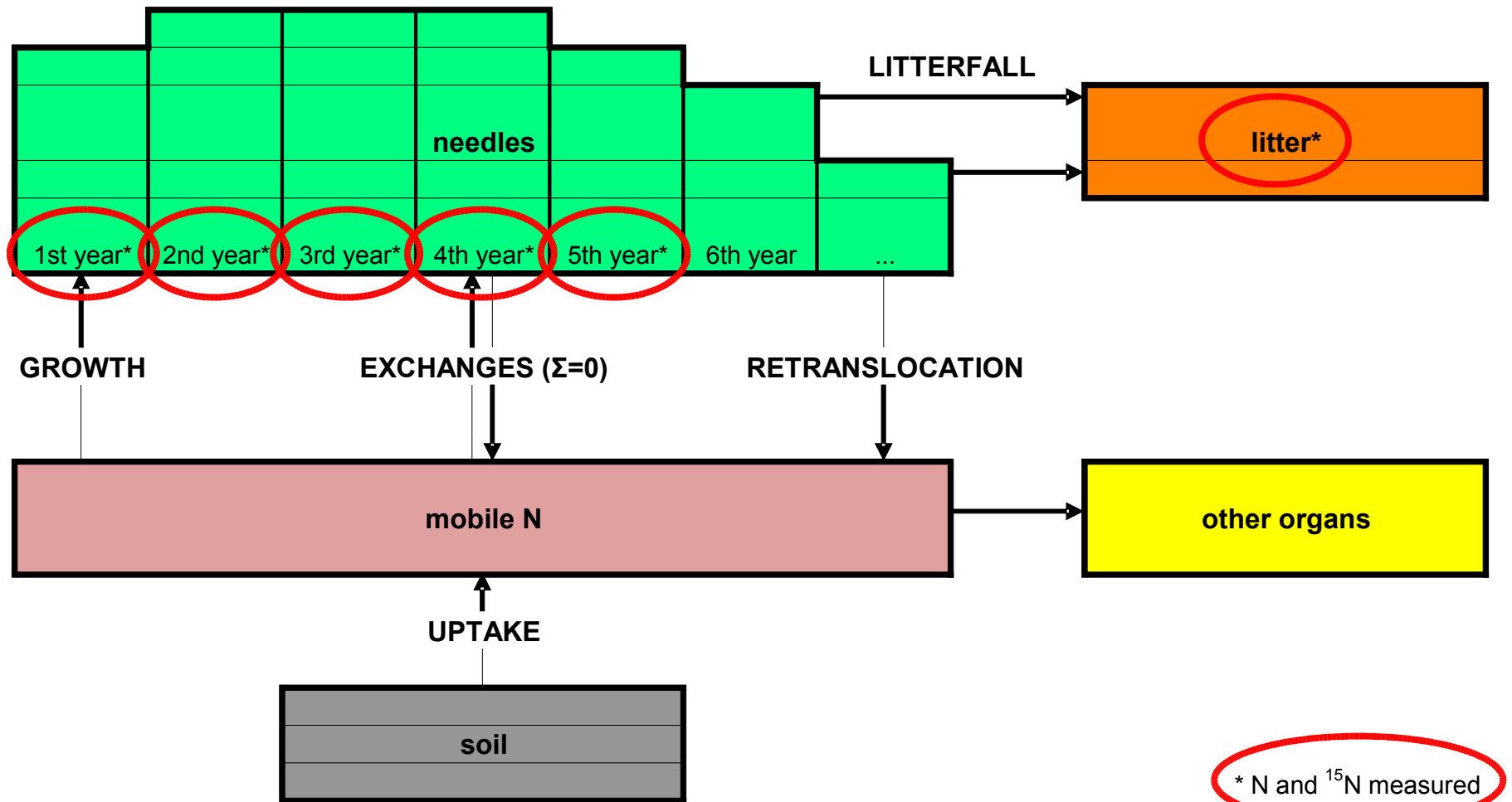
Leaf area index (LAI-2000, corrected)



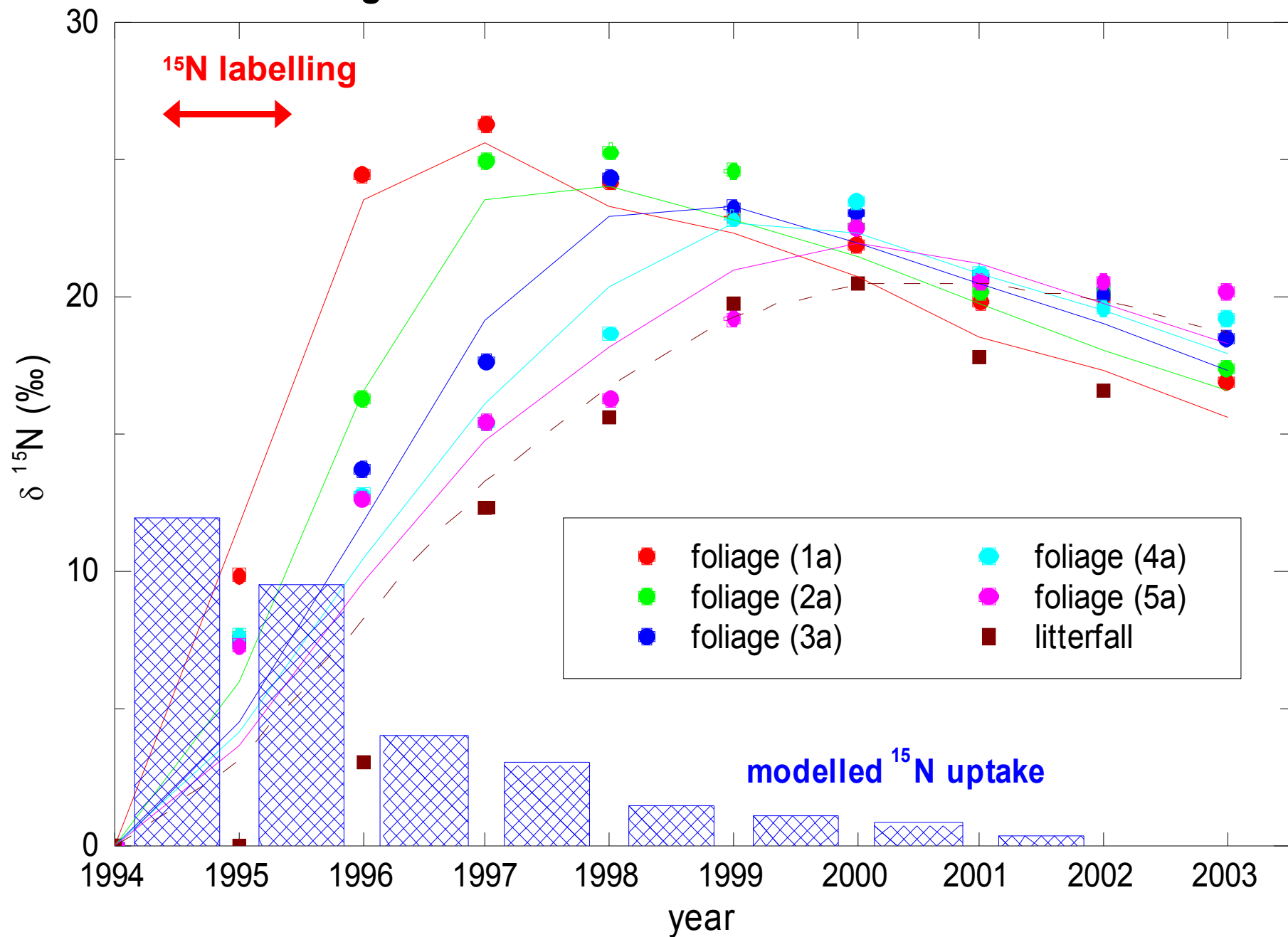
¹⁵N in neddle age classes and litter



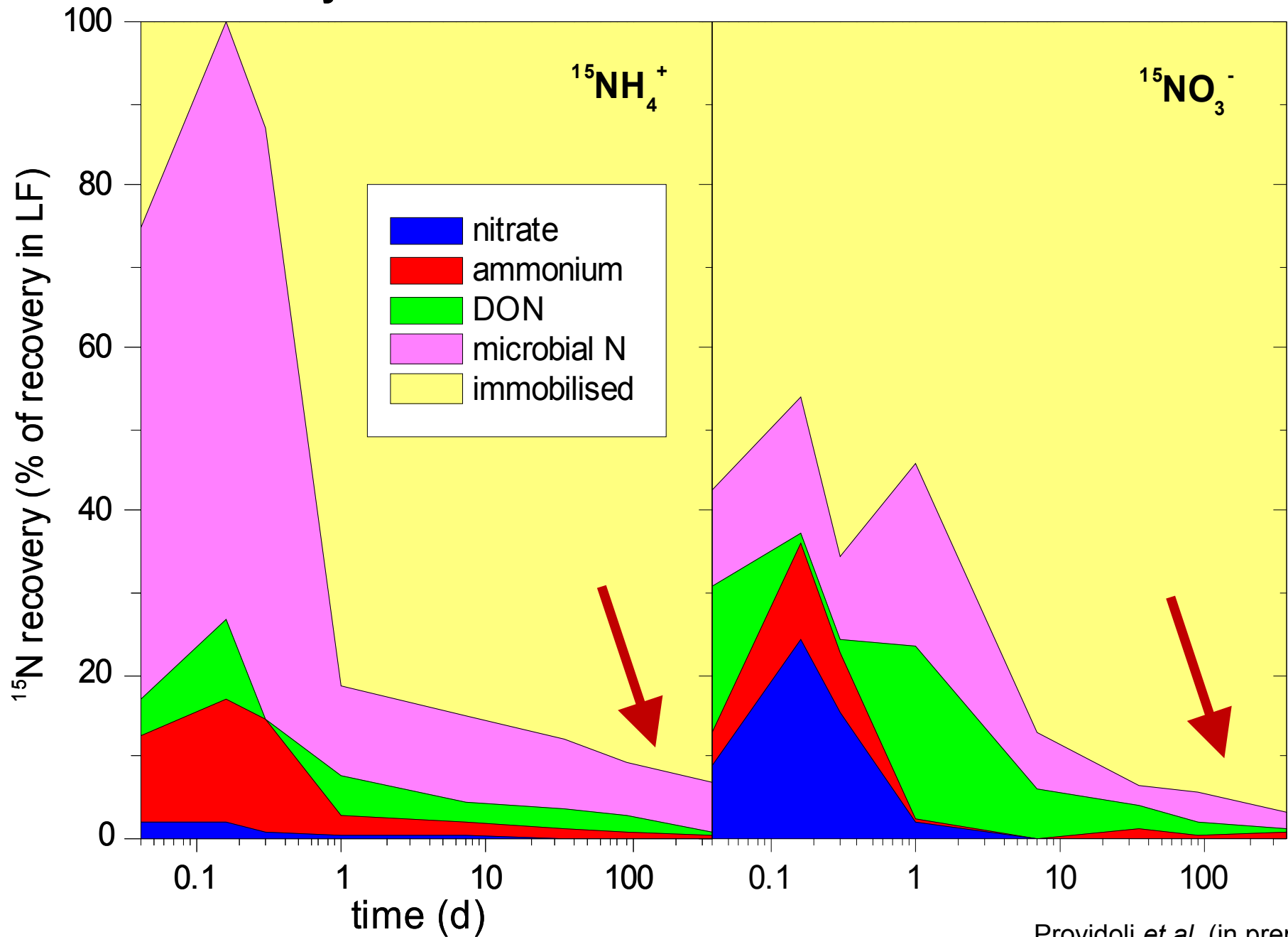
Nitrogen uptake and redistribution model



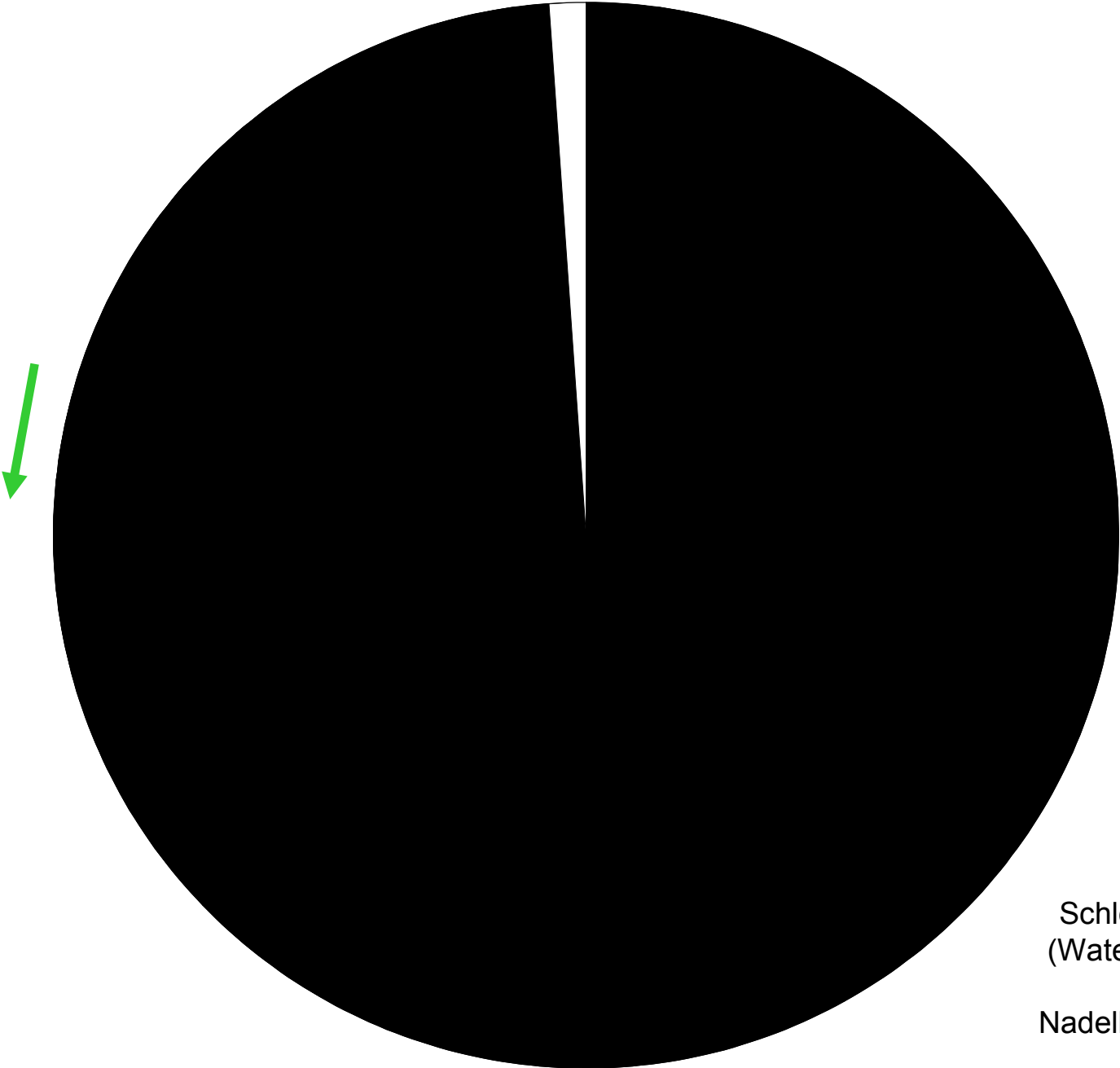
¹⁵N in neddle age classes and litter



^{15}N recovery in LF horizon



Partitioning of ¹⁵N after 7 years



Schleppi *et al.*, 1999
(Water Air Soil Pollut.)

Nadelhoffer *et al.*, 1999
(Nature)

Conclusions

- N deposition mostly immobilised in the soil
- N extractable / leachable only in short term
- but uptake by trees continues a few years
- ~15% of N deposition taken up by trees
- high N mobility in 2-5 year-old needles
- diagnostic: effects on needles after ~5 years
- effects on canopy or bole growth: later ?



THE END