An overview of recent developments in estimating critical loads of atmospheric deposition – the example of N in Terrestrial ecosystems

Providence, 2011-10-24

Salim Belyazid
Harald Sverdrup
Jennifer Phelan
Tim Sullivan

1- Dose response and “biodiversity” loss

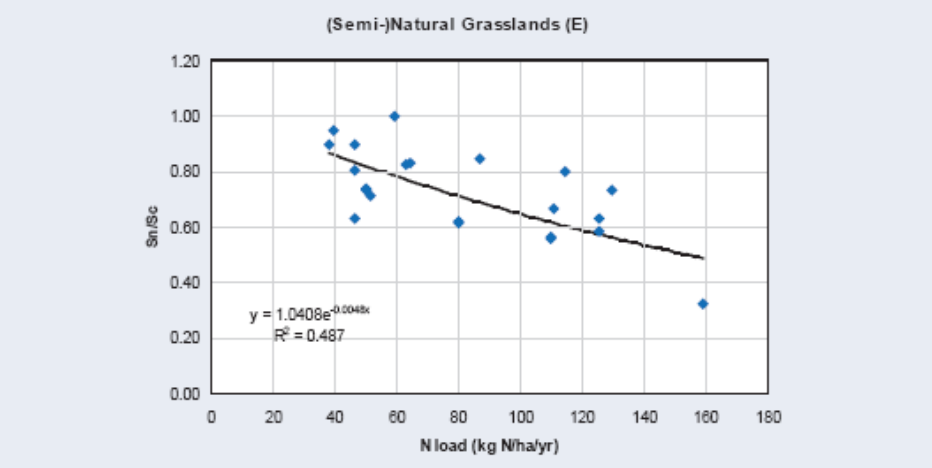


Figure 4-2 Relation between the species richness ratio (S_N/S_C) and total N load (N addition plus background deposition) in grassland habitats (6 countries; n = 22; p<0.001).

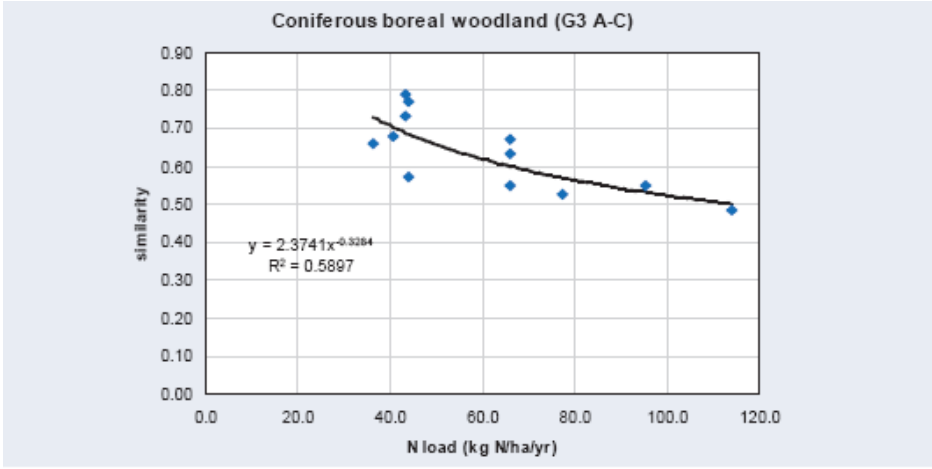


Figure 4-6 Sorensen's similarity index of N treated understorey vegetation, compared to the control vegetation in Swedish boreal forests (7 locations; (p <0.01; n = 12) against the total N load.

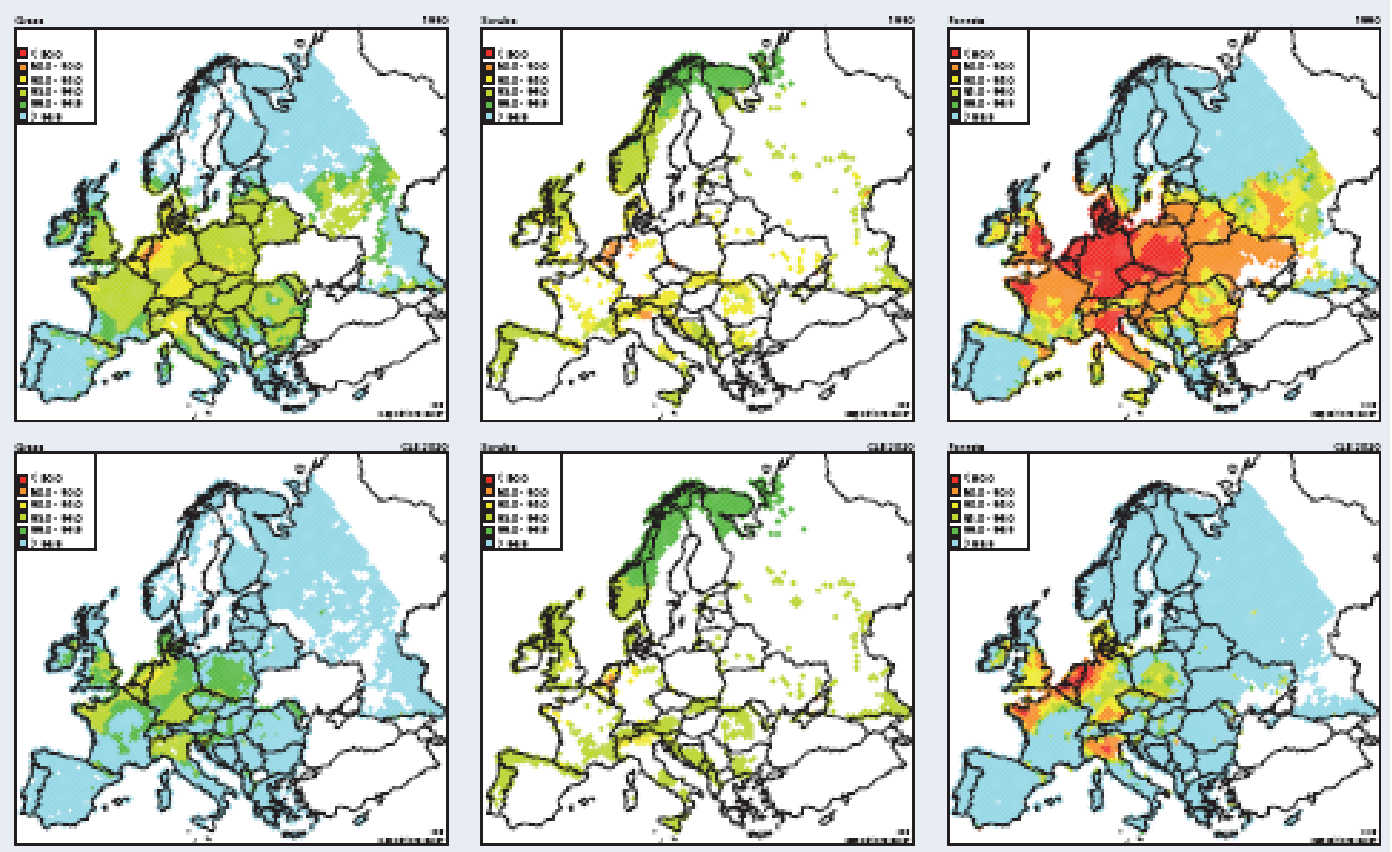
Bobbink, in Hettelingh et al. (eds.) 2008

1- Dose response based effects, the empirical critical loads

Grasslands **Scrubs** **Forests**

1990 dep.

CLE 2020



% species richness

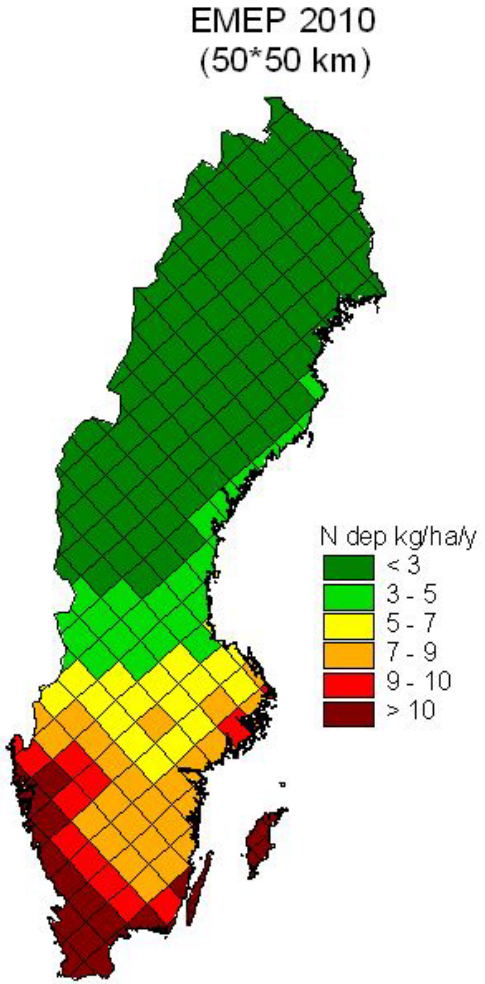
- < 80.0
- 80.0 - 90.0
- 90.0 - 95.0
- 95.0 - 99.0
- 99.0 - 99.9
- > 99.9

(http://www.pbl.nl/)

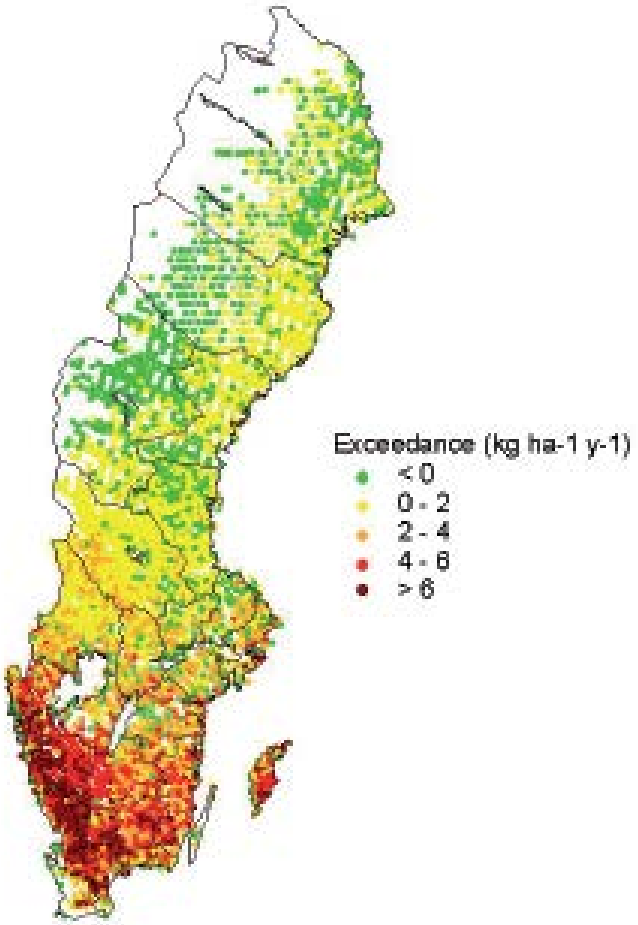
Revised Empirical CL 2010-2011

http://www.rivm.nl/bibliotheek/rapporten/680359002.pdf

2- Dynamically modelled exceedances of CLN over Sweden



Total N depostion



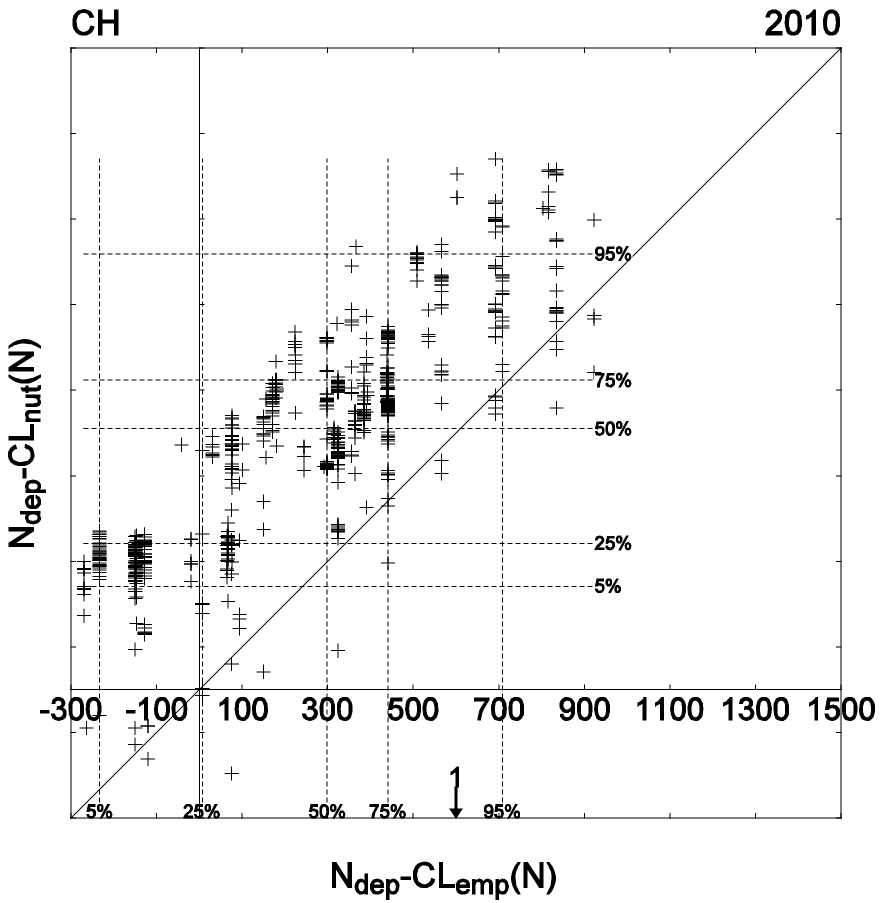
CLnutN exceedance,
critical limit: Soil solution N = 0.3mg/l

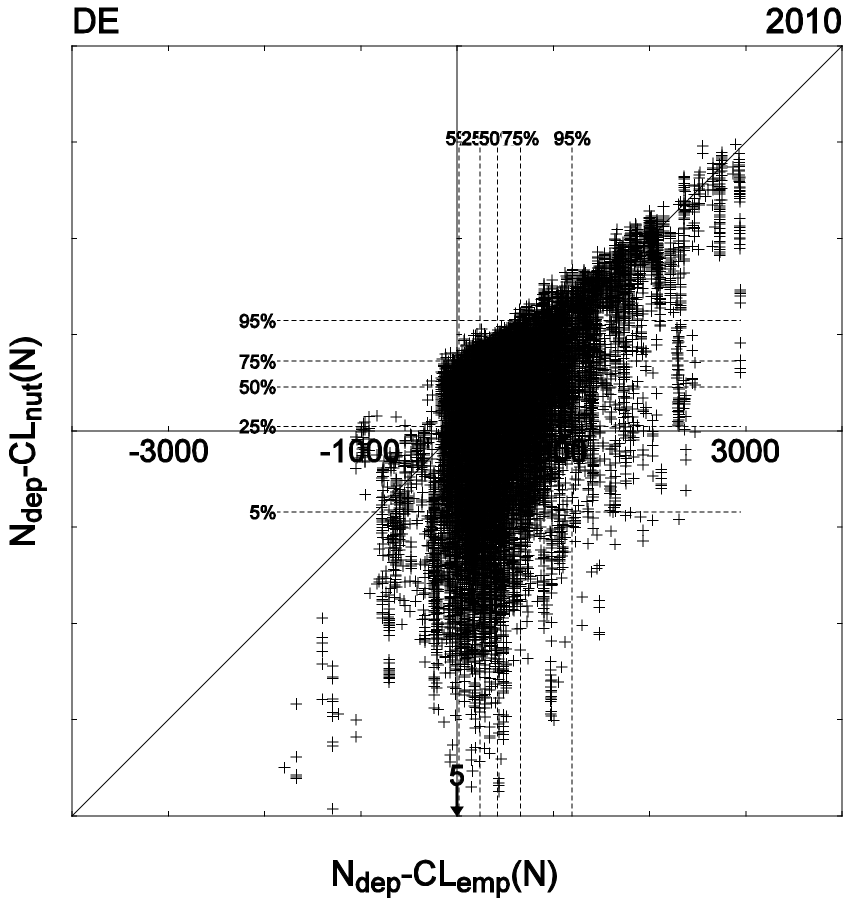
In Switzerland:

$nutN_{crit}$ = 0.3mg/l

In Germany:

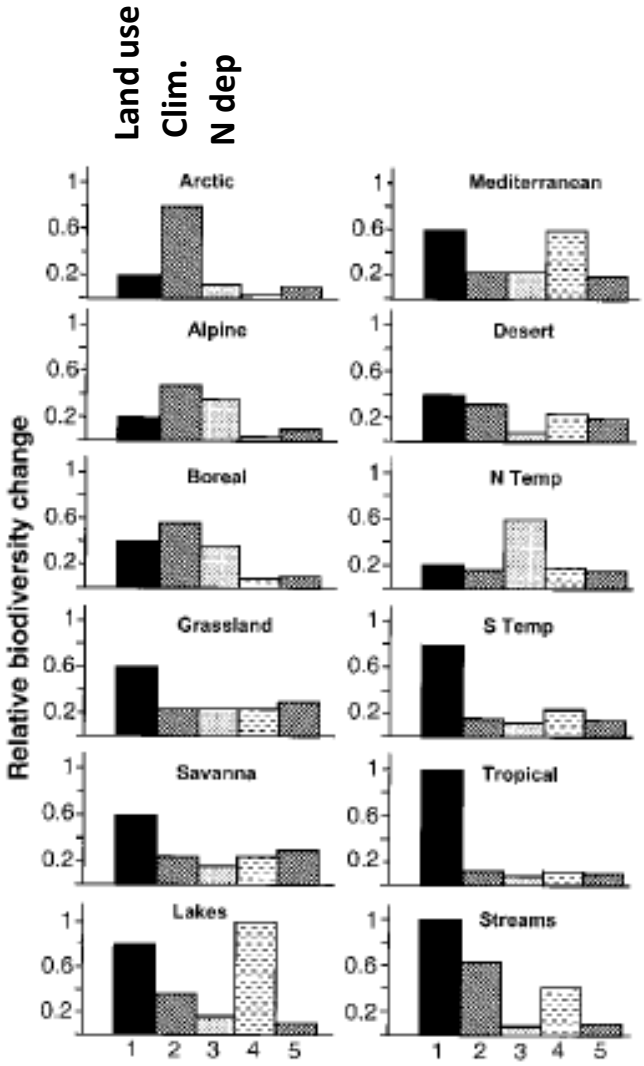
$nutN_{crit}$ = 3mg/l





Exceedances of CLempN and modelled CLnutN

JP Hettelingh, Pers. Comm., 2007



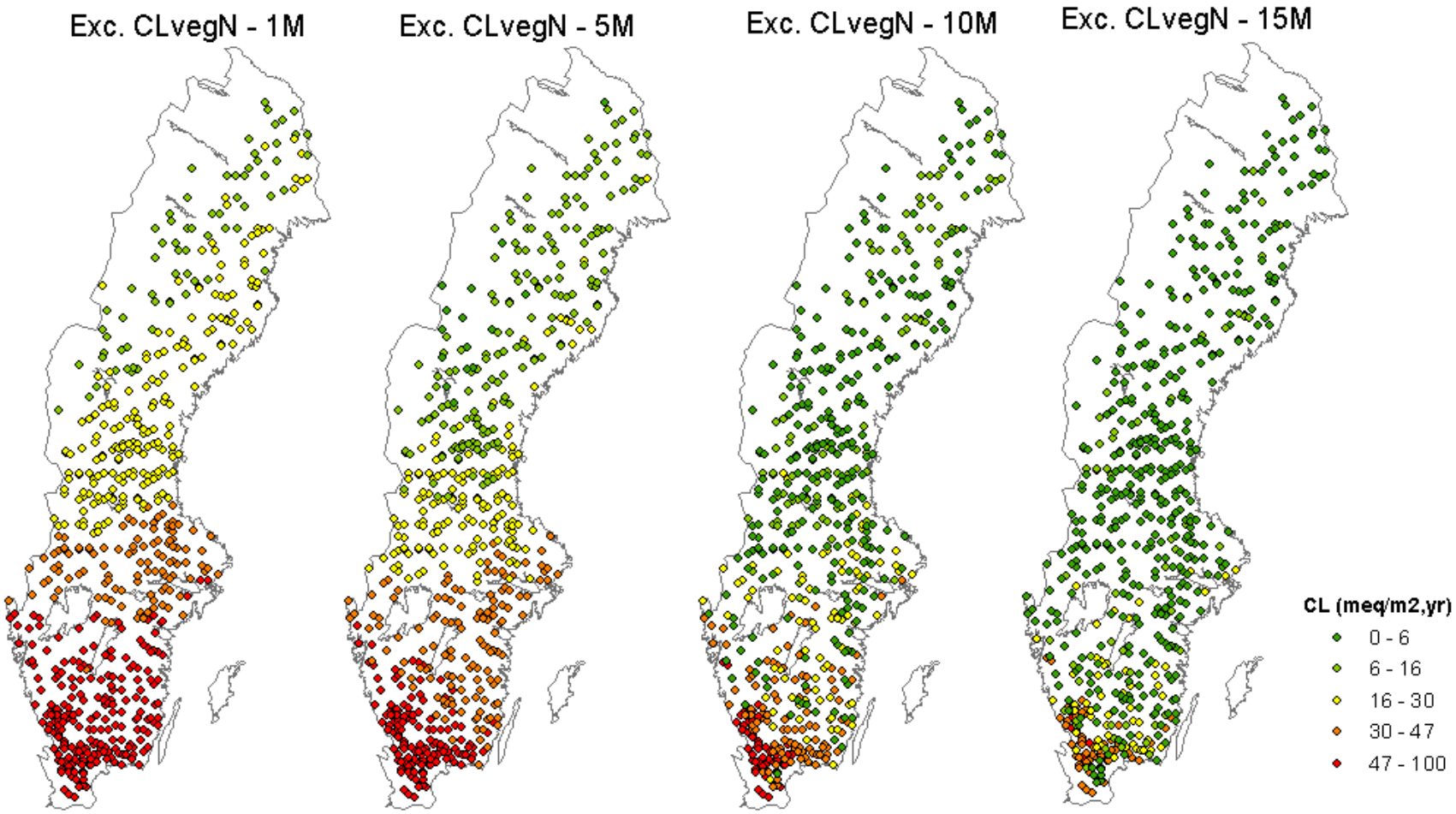
Sala et al., Science 2000

Fig. 2. Effect of each driver on biodiversity change for each terrestrial biome and freshwater ecosystem type calculated as the product of the expected change of each driver times its impact for each terrestrial biome or freshwater ecosystem. Expected changes and impacts are specific to each biome or ecosystem type and are presented in Tables 1 to 4. Values are relative to the maximum possible value. Bars: 1, land use; 2, climate; 3, nitrogen deposition; 4, biotic exchange; 5, atmospheric CO_2.

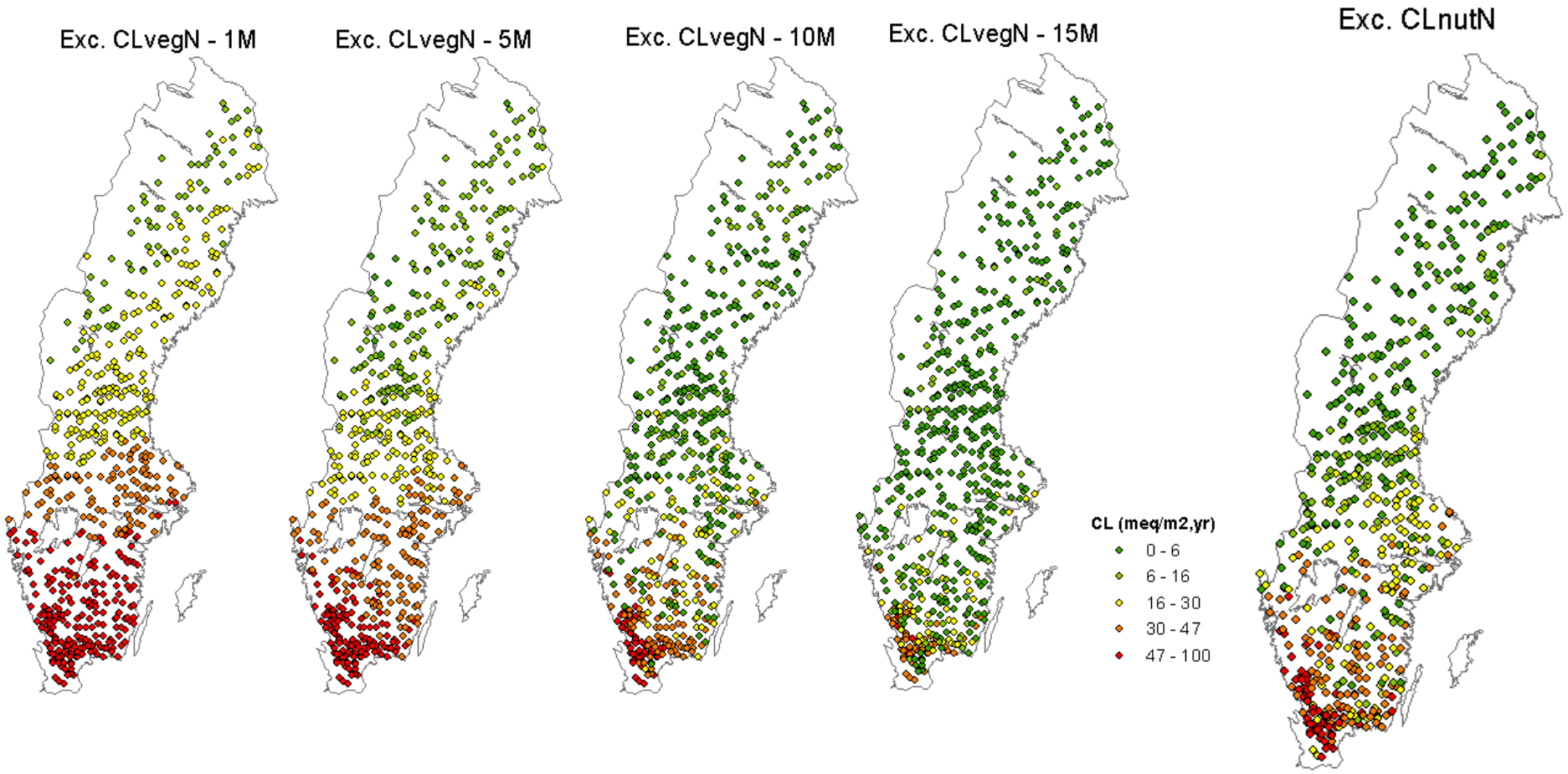
"from
multi-pollutant & multi-effect
towards a
multi-issue & multi-effect"

3- Integrated dynamically modelled CLN based on vegetation change

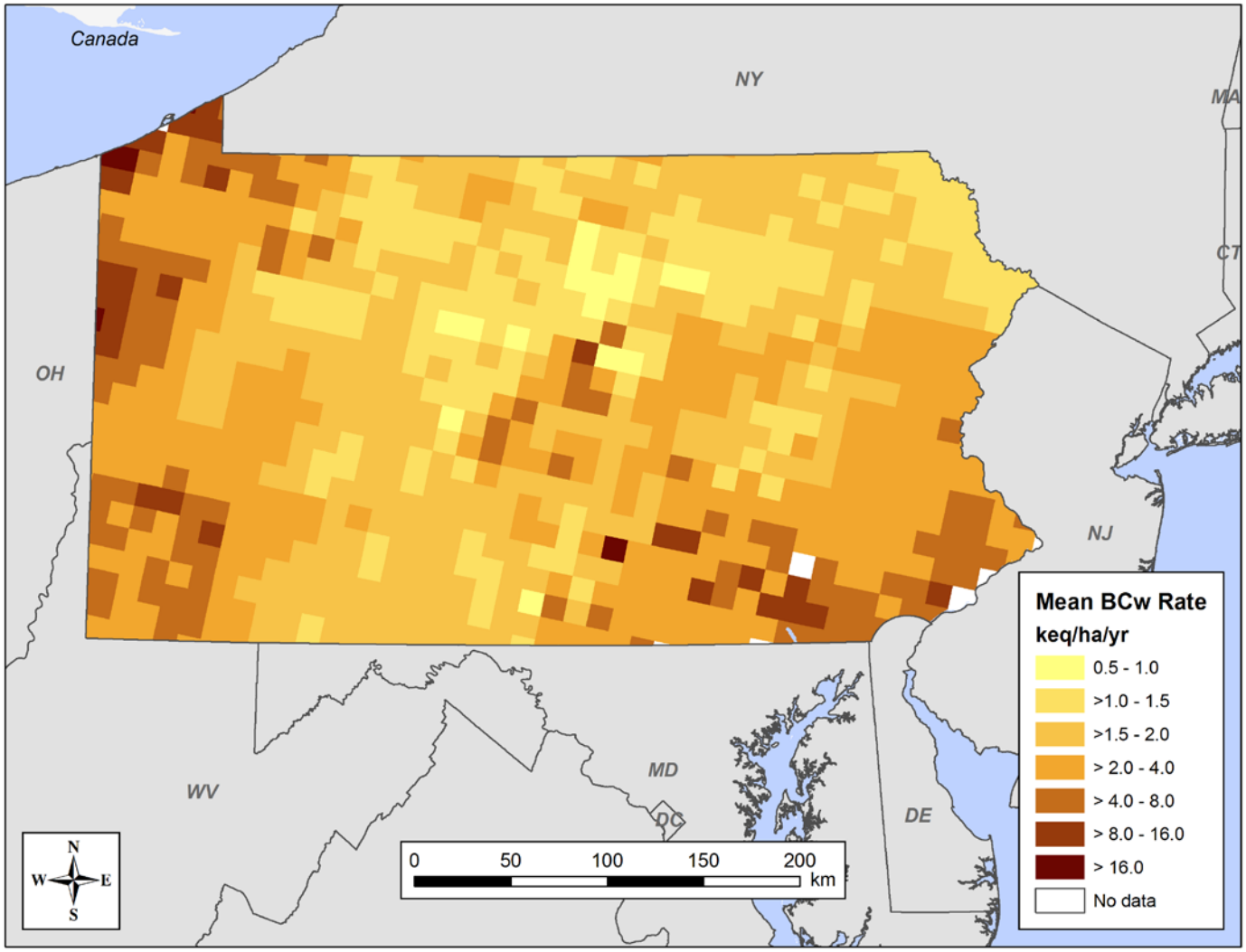
Exceedances of CLvegN by CLE deposition



Comparison with CLnutN exceedance



Weathering rates with the dynamic model PROFILE Comparison with CLnutN exceedance



Vegetation changes with climate changes and N deposition with ForSAFE-Veg