



SWETHRO



**The Swedish Throughfall Monitoring
Network (SWETHRO)
- 25 years of monitoring air pollutant
concentrations,
deposition and soil water chemistry**

Gunilla Pihl Karlsson, Per Erik Karlsson, Sofie Hellsten
& Cecilia Akselsson*

IVL Svenska Miljöinstitutet
*Lunds Universitet

Content

Short introduction to SWETHRO

Some results from SWETHRO





Started in 1985.

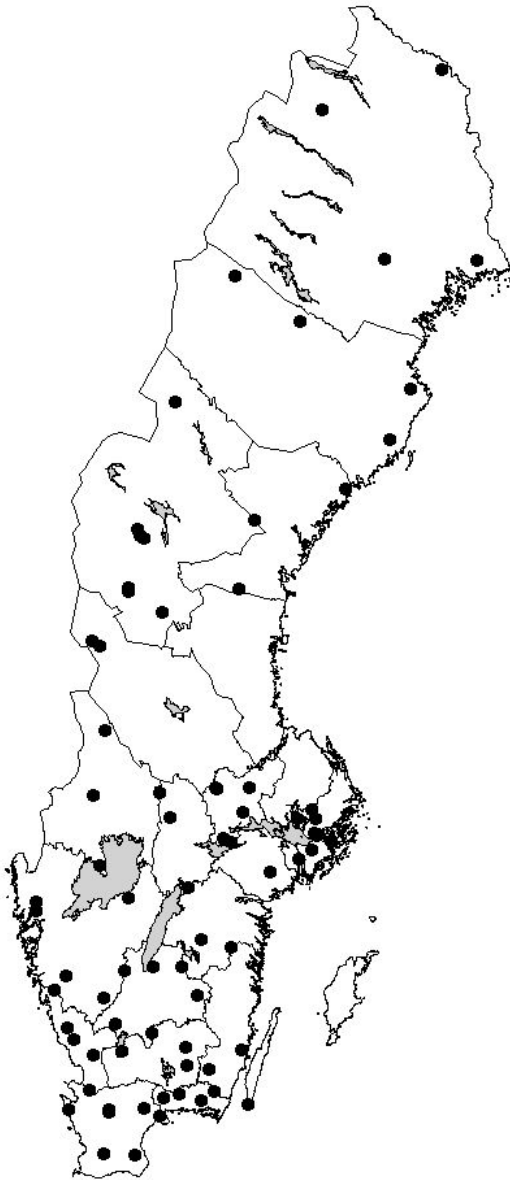
Today about 65 active plots

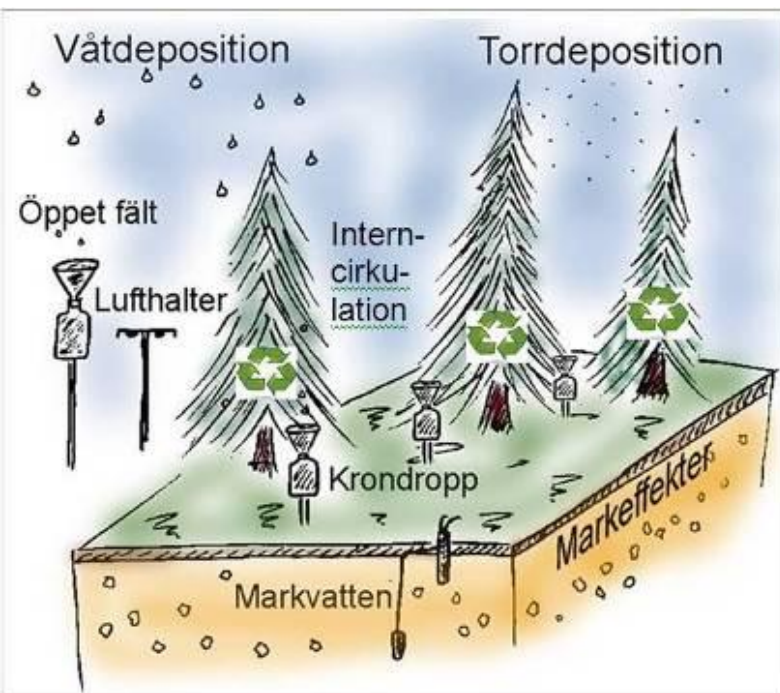
Goal:

- to measure air concentrations, deposition and soilwater chemistry in managed forest ecosystems across Sweden.
- calculate the effects of air pollution on forests, soil and water.
- by measurements and modeling give basis to Sweden's environmental objectives on a regional and national scale

Funded by:

Regional air quality protection associations, County administrative boards and the Swedish Environmental Protection Agency etc.





Measurements:

Air concentration, open field- and throughfall deposition, on a monthly basis all year around.

Soil water chemistry, three times a year, at 50 cm depth.

Measured parameters:

Air: SO₂, NO₂, NH₃ and O₃

Deposition : pH, SO₄-S, Cl, NO₃-N, NH₄-N, Ca, Mg, Na, K, Mn, Kj-N and DOC

Soil water: pH, SO₄-S, Cl, NO₃-N, NH₄-N, Ca, Mg, Na, K, Mn, Fe, ioAl, oAl and DOC



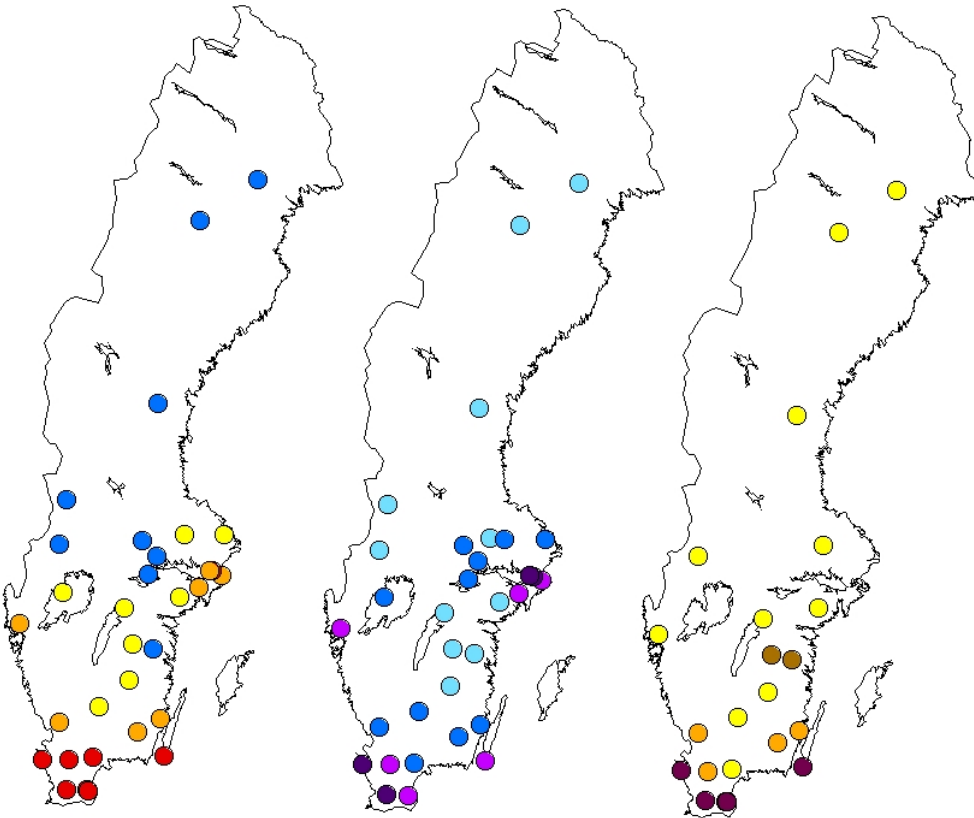
Year 2000/2001

Även O3

a) SO₂

b) NO₂

c) NH₃



SO₂ (µg m⁻³)

- Blue: < 0.6
- Yellow: 0.6 - 0.8
- Orange: 0.8 - 1.0
- Red: > 1.0

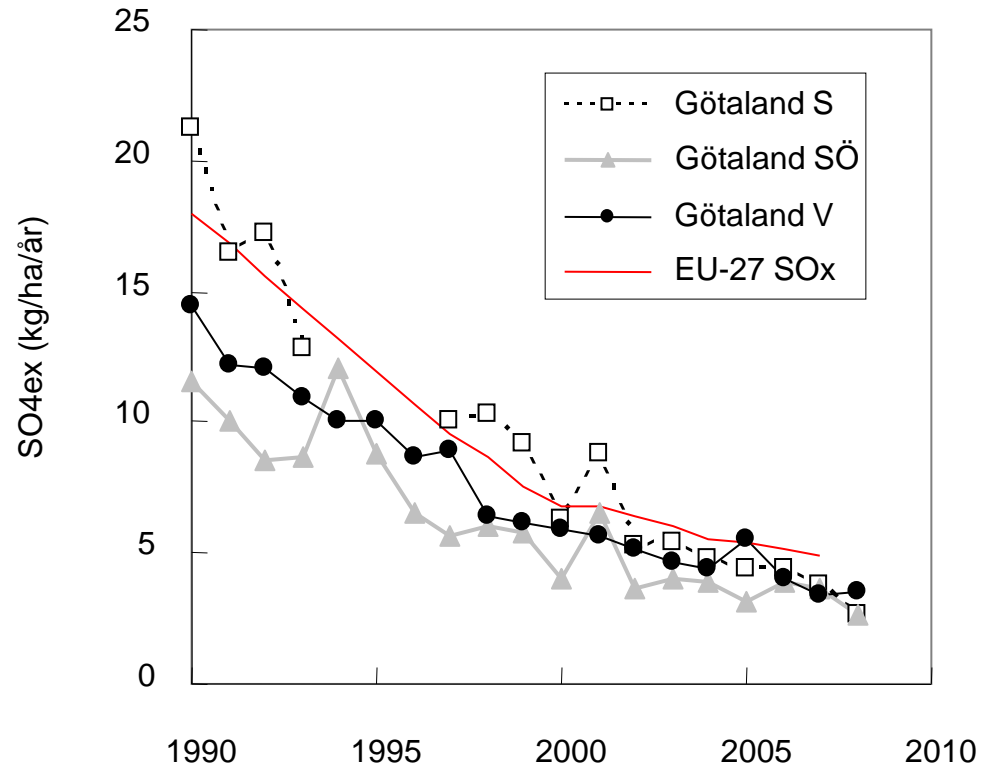
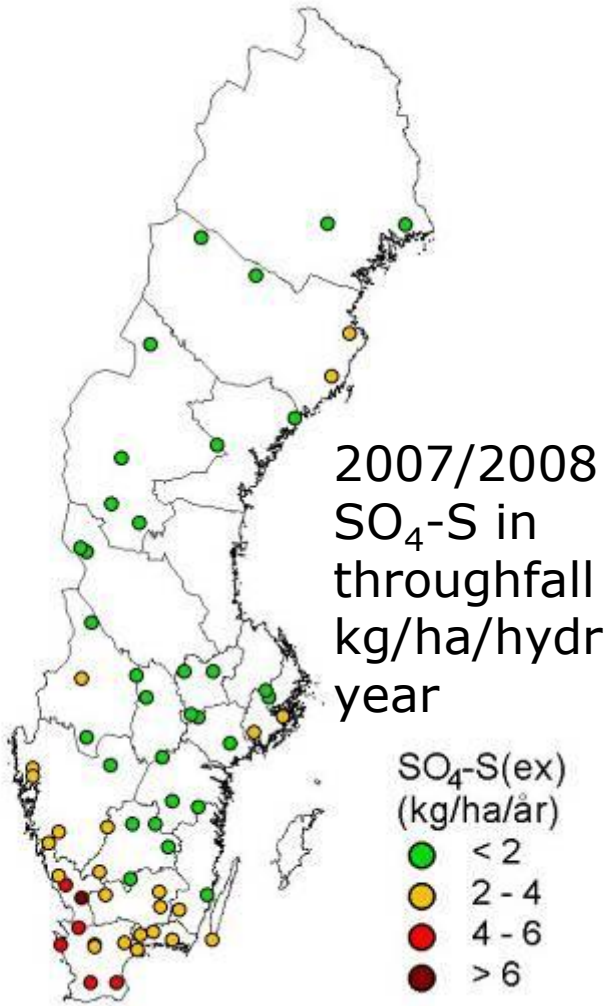
NO₂ (µg m⁻³)

- Light blue: < 2
- Medium blue: 2 - 4
- Dark blue: 4 - 6
- Purple: > 6

NH₃ (µg m⁻³)

- Yellow: < 0.5
- Orange: 0.5 - 0.6
- Brown: 0.6 - 0.7
- Dark brown: > 0.7

Acidification, deposition



IVL Report B 1896.

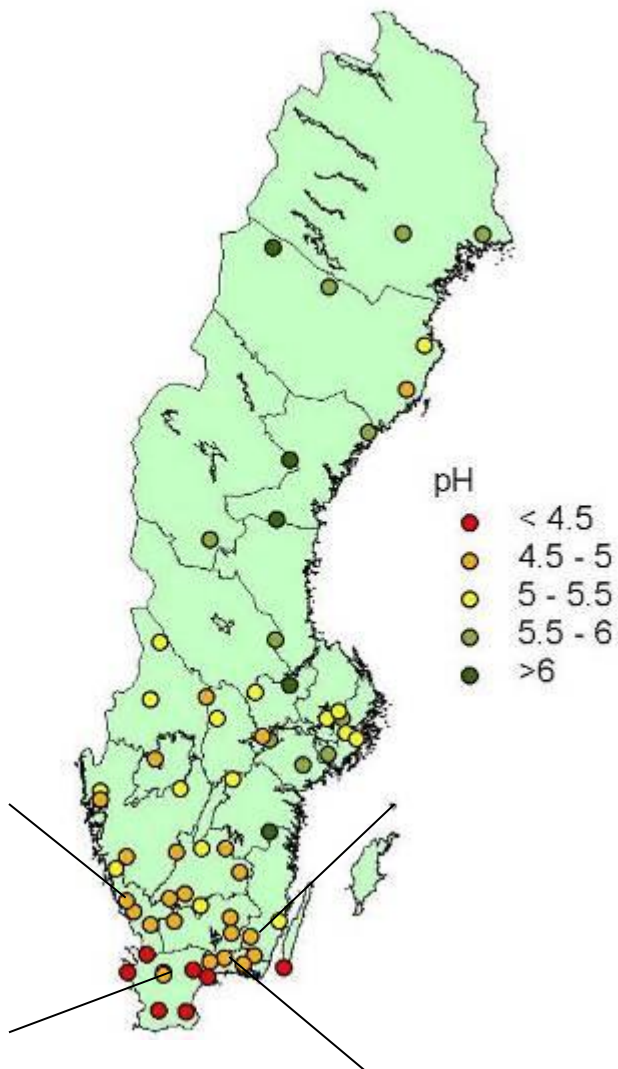
2008:
pH in soil water

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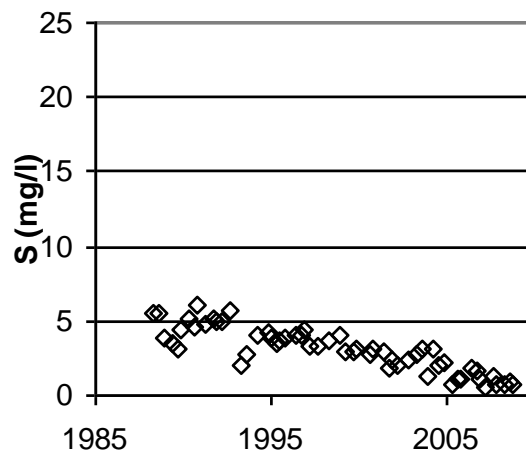
**Acidification,
Soil water**



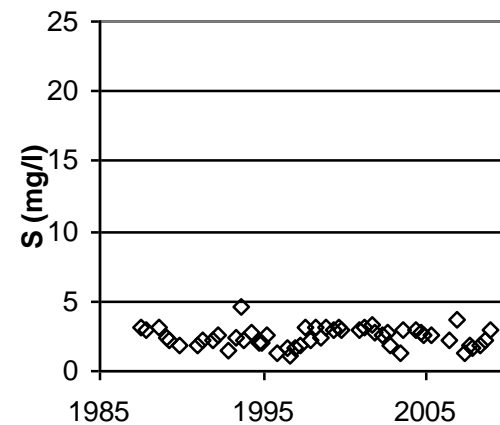
SO4-S in soil water



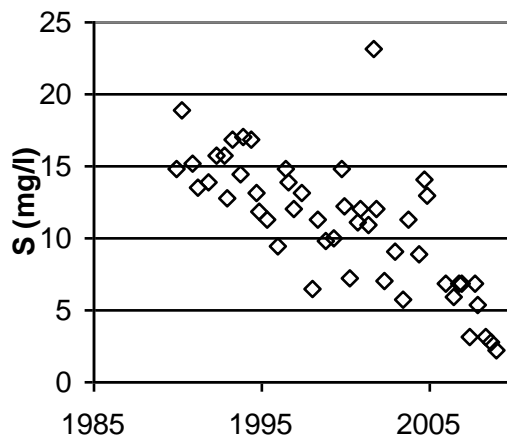
Söstared



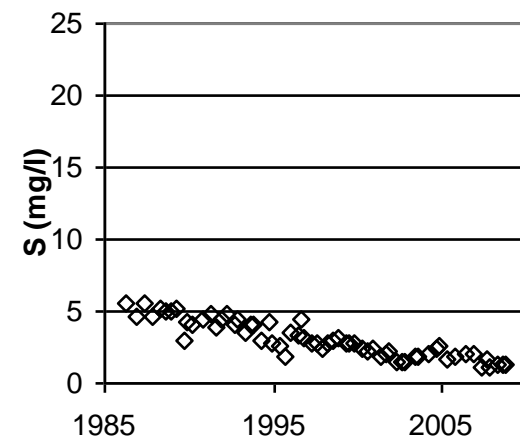
Knapanäs



Arkelstorp



Hjärtsjömåla



2007

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Acidification, modeling

Acidification of lakes

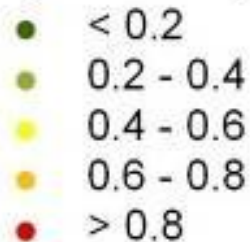
-Criteria: pH-minskning $> 0,4$

-4 % antropogenically acidified lakes in 2007

-3 % antropogenically acidified lakes in 2020

-Most antropogenically acidified lakes in southwestern parts

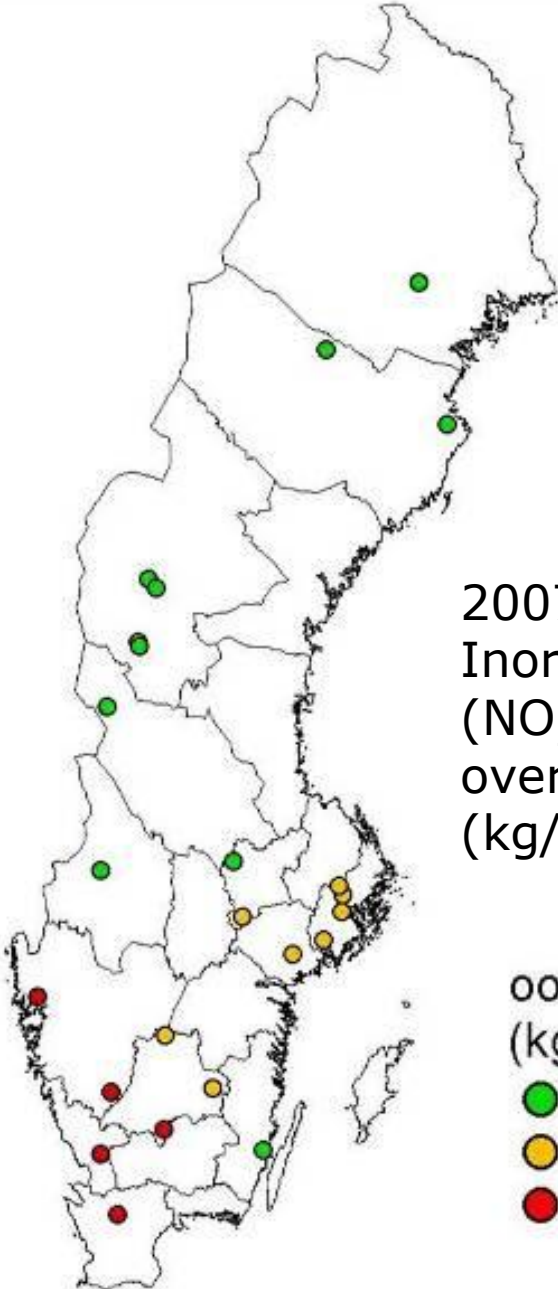
dpH för RI-sjöar



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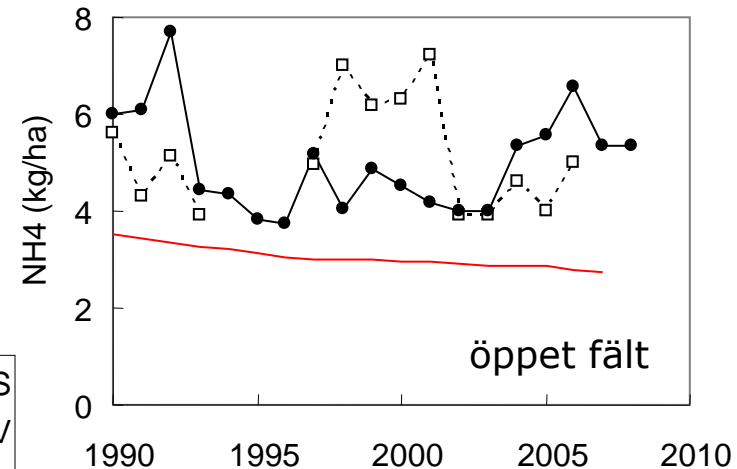
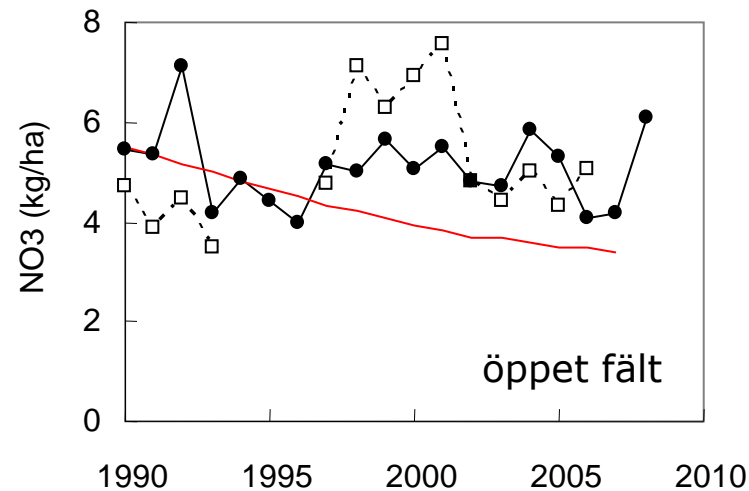
Eutrophication, deposition of nitrogen



2007/08
Inorganic nitrogen
($\text{NO}_3 + \text{NH}_4$)
over **open field**
(kg/ha/hydr år)

oorg. kväve
(kg/ha/år)

- < 5
- 5 - 10
- > 10



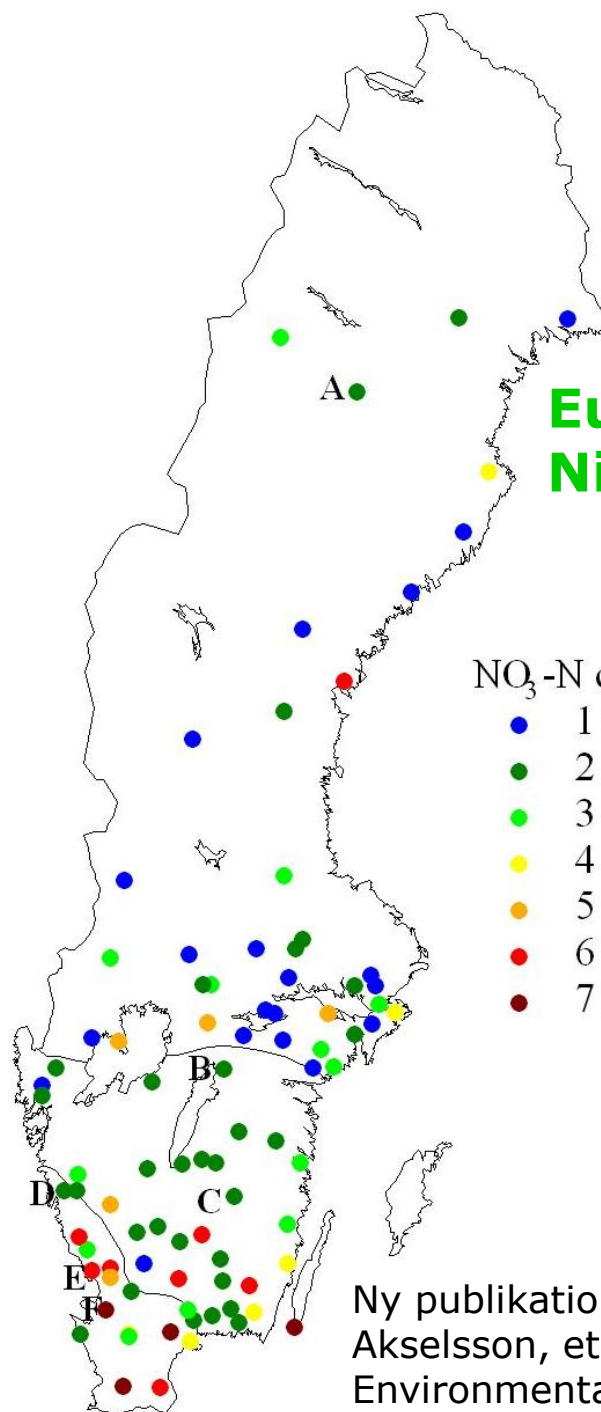
- Götaland S
- Götaland V
- EU-27



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**Eutrophication,
Nitrate in soil water**



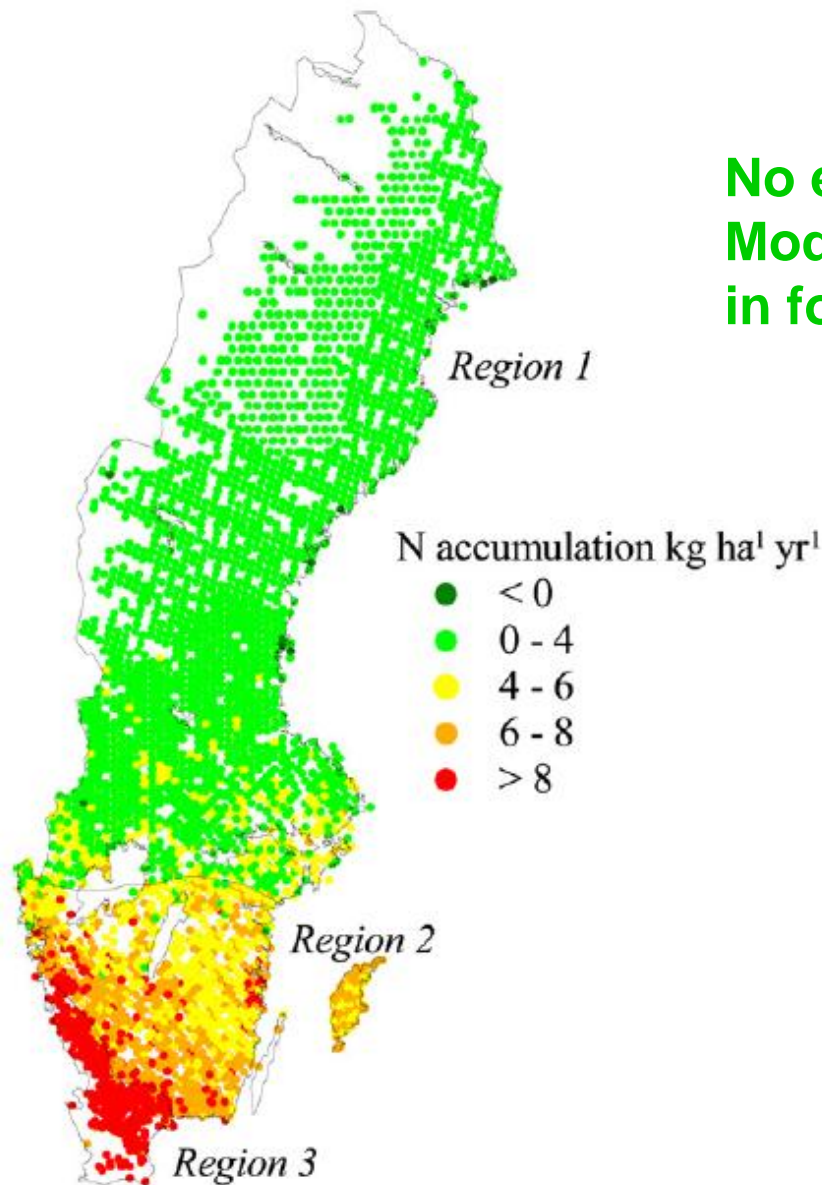
NO₃-N concentration class

- 1 (Very low concentrations)
- 2
- 3
- 4
- 5
- 6
- 7 (Substantially elevated concentrations)

Ny publikation:
Akselsson, et al. 2010.
Environmental Pollution 158, 3588-3595.



No eutrophication, Modeling nitrogen accumulation in forest soils



Method:

- Nitrogen balance calculations
- Spruce and Pine forests
- Scenario only stemwood

Akselsson, et al. 2010.
Environmental Pollution 158, 3588-3595.

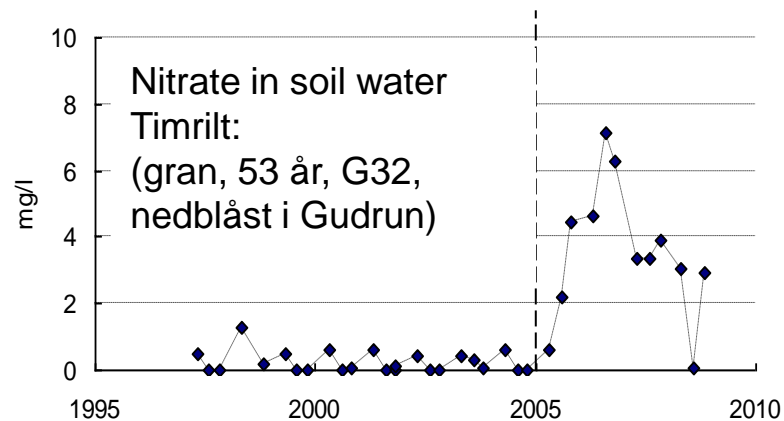
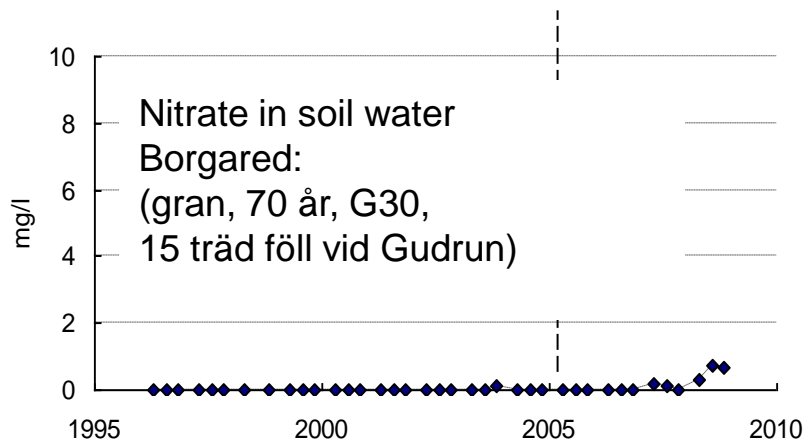


New bulkdeposition- sampler

Developed by Martin Ferm
& Olle Westling

Funded by Naturvårdsverket

Storm effects. Leakage of nitrate in soil after the storm Gudrun in 2005. Funded by the Swedish EPA



Under publication





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Estimates of total deposition of nitrogen and base cations to forests

Se presentation by Per Erik Karlson

M. Fern, H. Hultberg / Atmospheric Environment 33 (1999) 4421-4430

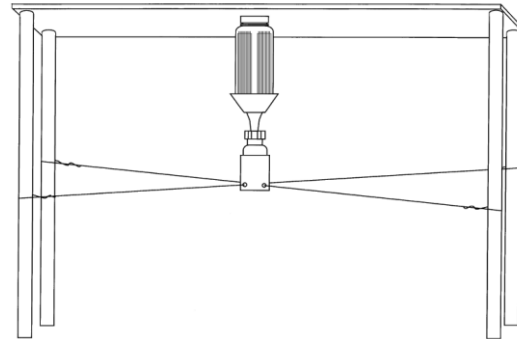
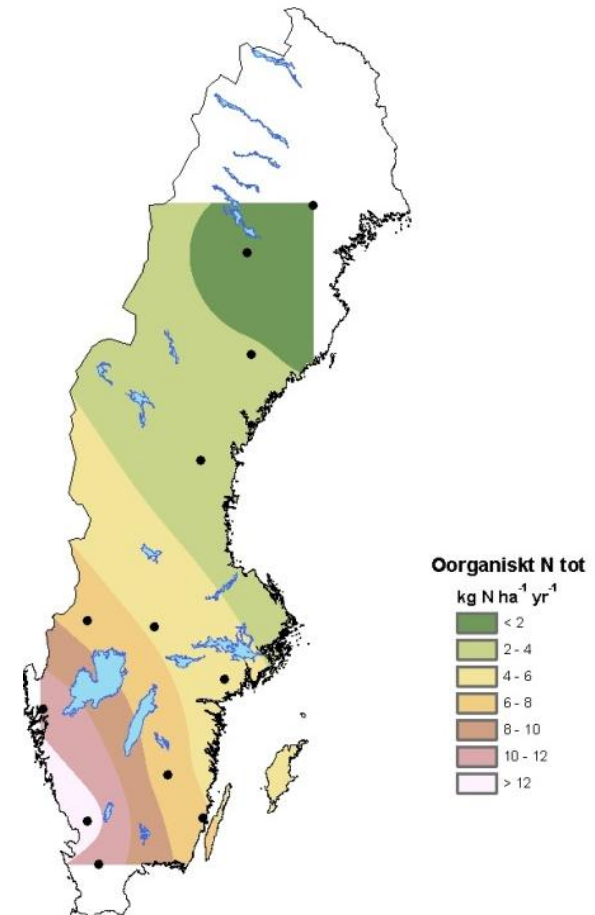
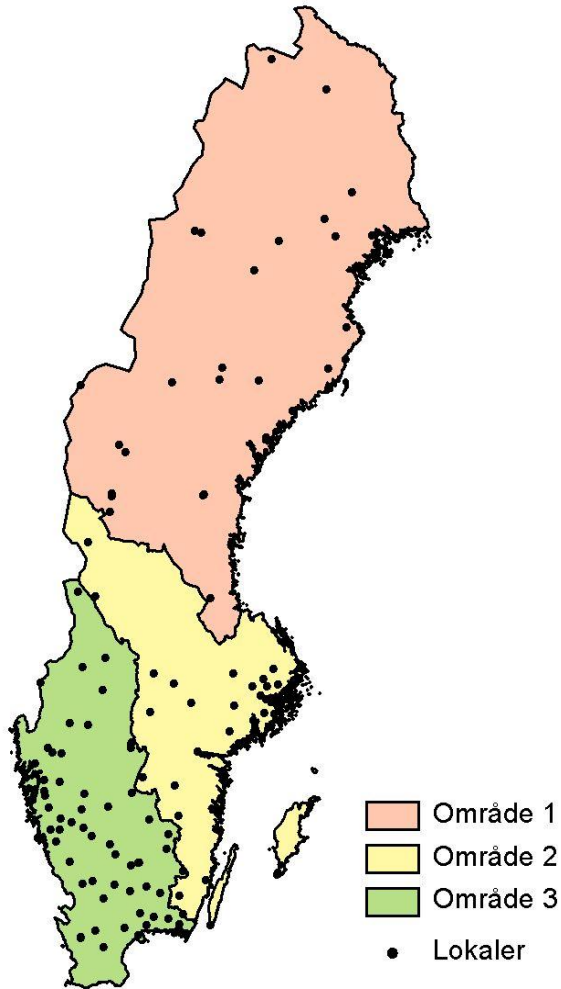


Fig. 2. The surrogate surface that is simple to produce mounted under a roof.



Ny publikation:
IVL Rapport B 1952 (preliminär).

Bulk deposition of nitrogen over Sweden has not changed significantly between 1990-2000 or 2000-2010.

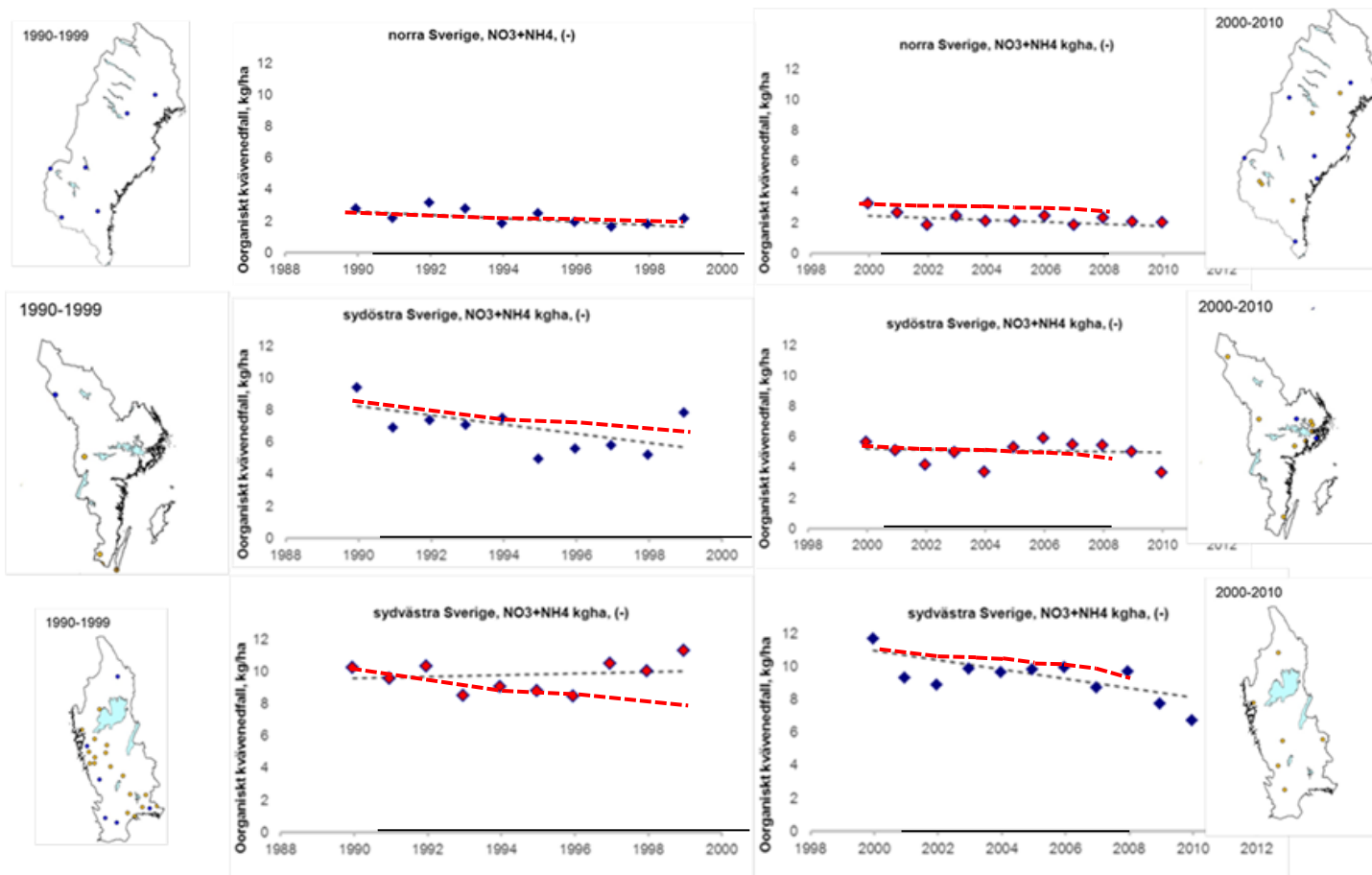


Det samlade nedfallet av oorganiskt kväve med nederbörden över Sverige har under 1990-1999 och 2000-2010 inte minskat i den utsträckning att det kan påvisas som en statistiskt säkerställd förändring i någon del av landet, trots betydande minskningar av Europas kväveutsläpp.

Vid ett fåtal mätplatser med mycket långa mätserier kan man dock påvisa ett minskat nedfall av oorganiskt kväve, främst i norra Sverige.

Bulk deposition of nitrogen over Sweden has not changed significantly between 1990-2000 or 2000-2010.

NO₃ + NH₄



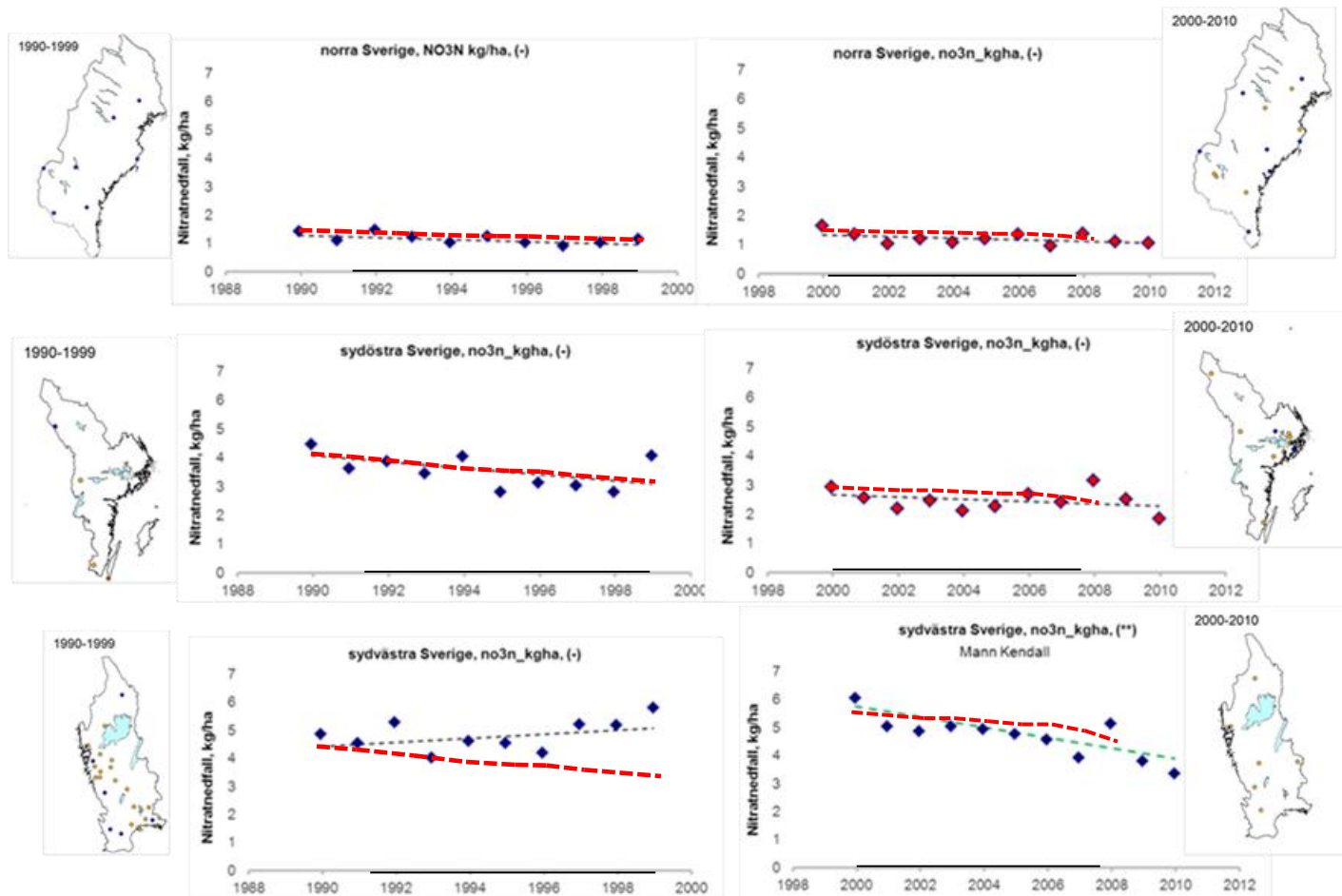
Funded by the Swedish EPA

Områdesvis analys av medelvärden för förekommande mätplatser – norra, sydöstra och sydvästra områdena. Vidstående kartor visar vilka mätplatser som är inkluderade i medelvärdesbildningen för respektive område. Figurer med röda symboler visar medelvärden som har bildats utifrån data från både LNKD och KD-nätet. Figurer med blå symboler visar medelvärden som har bildats utifrån data från endast det ena av LNKD och KD-nätet. Röd linje är emissioner från EU-27

Nitrate (NO₃)

1990-2000

2000-2010



Funded by the Swedish EPA

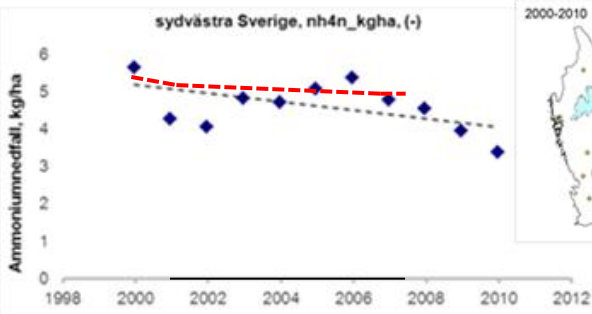
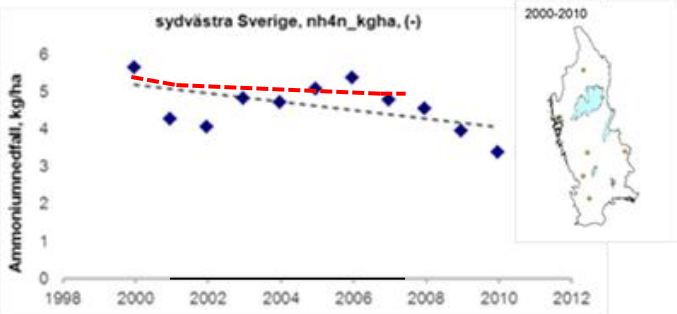
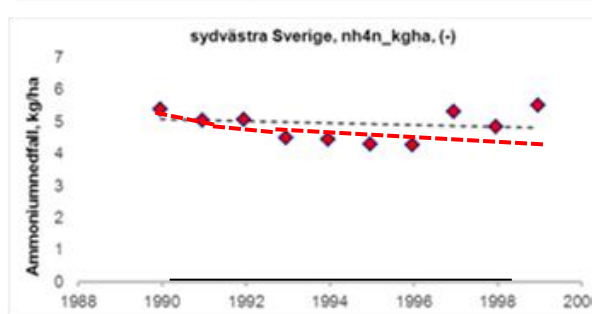
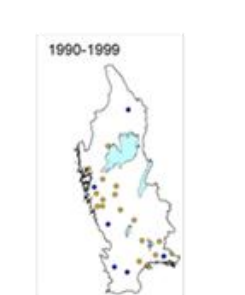
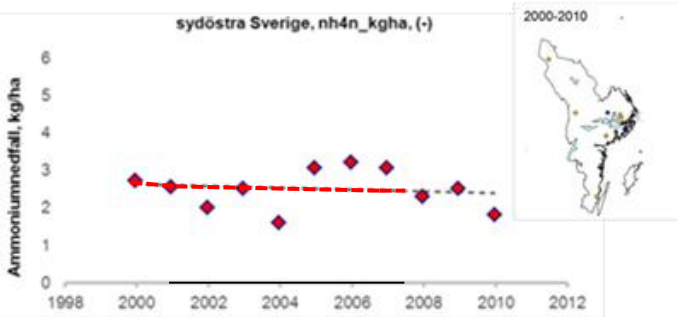
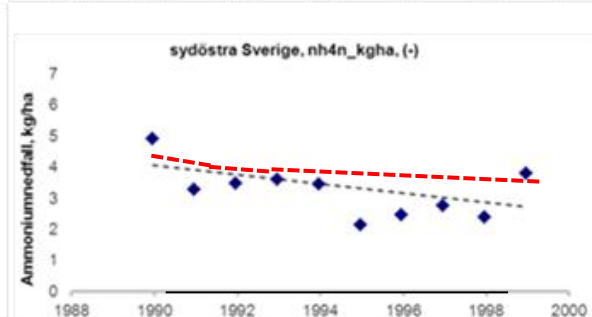
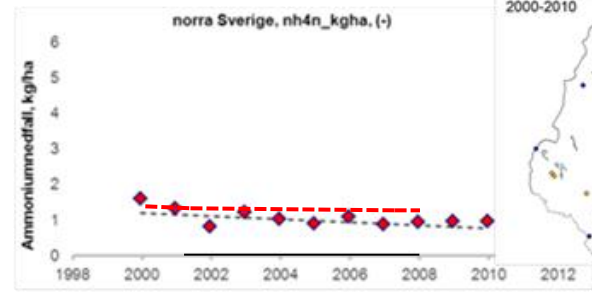
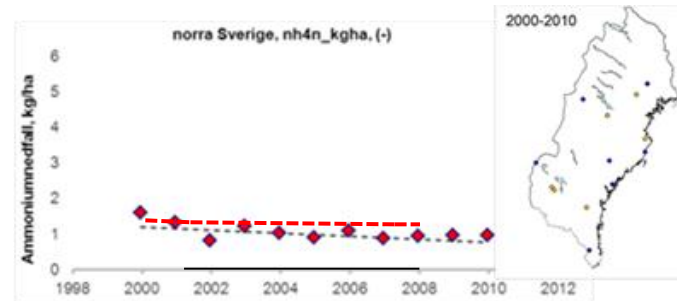
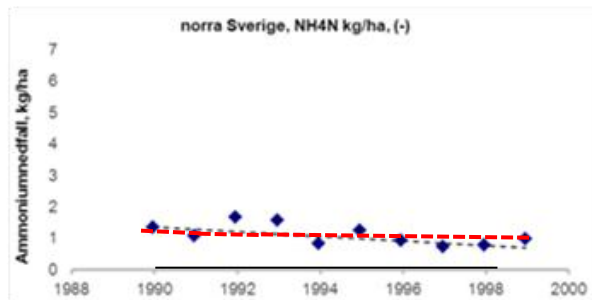
Presentation SWETHRO, 25-27 April 2012

www.krondroppsnetet.ivl.se

Ammonia (NH₄)

1990-2000

2000-2010



Funded by the Swedish EPA

Presentation SWETHRO, 25-27 April 2012

www.krondroppsnetet.ivl.se