ICP Waters

International Cooperative Programme on Assessment and Monitoring Effects of Air Pollution on Rivers and Lakes

Aims

- Assess the *degree* and *geographic extent* of the impact of atmospheric pollution, in *particular acidification*, on *surface waters*
- Collect information to evaluate *dose/response relationships*
- Describe and evaluate *long-term trends and variation* in *aquatic chemistry and biota* attributable to atmospheric pollution

Progress & results

- Status participation
- Report from Task Force meeting
- Recent and planned reports
- Relevant results in light of unofficial document Gothenburg Protocol Review Group

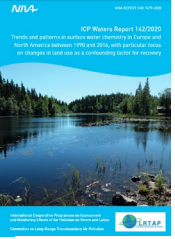
Status participation

	Chemical data (last year with data)	Biological data (last year with data)	Participation in TF meetings 2018-2020	Participation in chemical intercomparison 2017-2019	Participation in biological intercalibration 2017-2019
Armenia	2008		•		
Austria	2012		•	•	
Belarus	2014				
Belgium				•	
Canada	2017		•	•	
Czech Rep.	2016	2017	•	•	
Estonia	2017		•	•	•
Finland	2017		•	•	
France			•	•	
Georgia			•		
Germany	2019	2018	•	•	•
Ireland	2017	2016	•	•	•
Italy	2017		•	•	
Latvia	2019	2018	•		•
Lithuania			•	•	
Moldova	2017		•		
Netherlands	2014				
Norway	2019	2019	•	•	•
Poland	2017		•	•	
Russia	2014		•	•	
Serbia			•		
Spain	2013		•	•	
Sweden	2016	2018	•	•	•
Switzerland	2018	2017	•	•	•
UK	2016	2015	•	•	
USA	2016		•		
Total	**20**	**8**	**23**	**18**	**7**

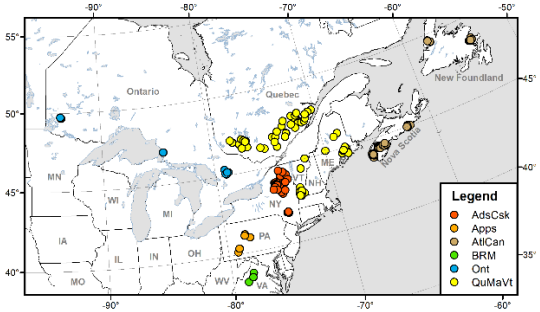
- Virtual Task Force meeting joint with ICP Integrated Monitoring
  - Remote organization allowed for easier participation from other ICPs
- Stable participation overall, new contacts with Georgia and Armenia

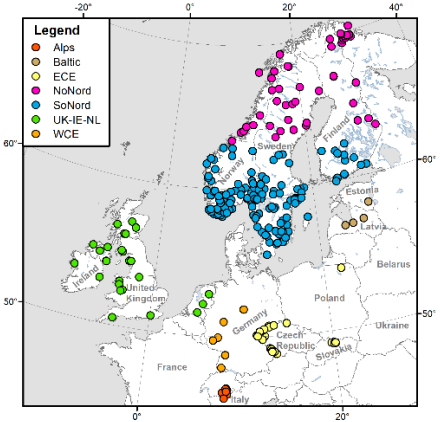
Task Force meeting

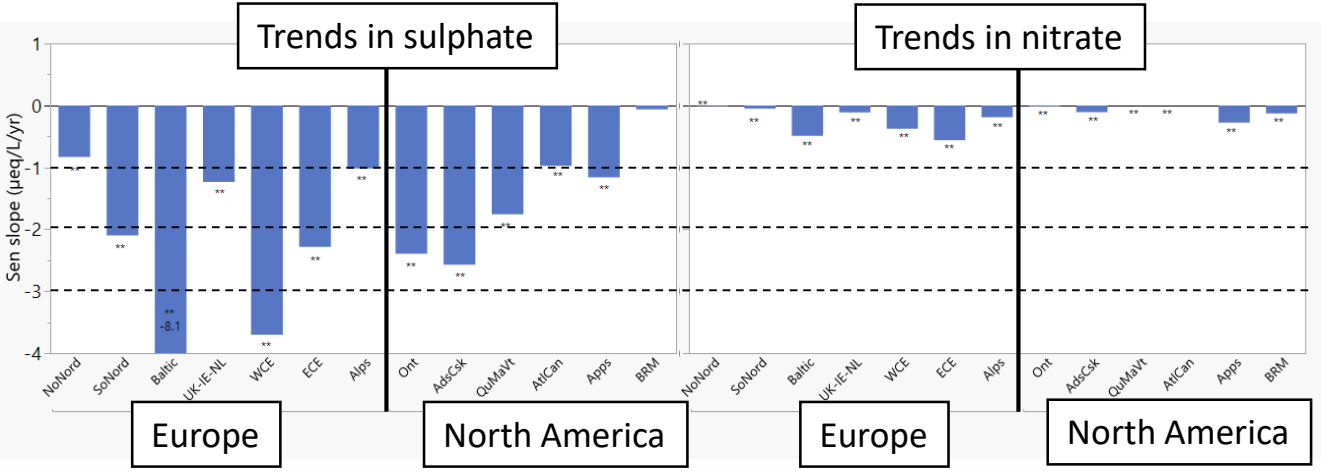
- Trends in recovery of acidification (new report)
- Trends and impacts of nitrogen in surface waters; contribution to empirical critical loads (ongoing report)
- Biodiversity
- Climate impacts on recovery
- Microplastics in remote lakes
- Long-term scientific strategy
- NEC Directive
- Call for land cover data
- Recent scientific publications
- Minutes are available at www.icp-waters.no



Trends in water chemistry (1990-2016)

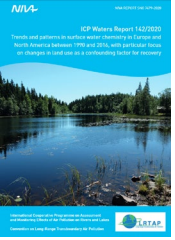




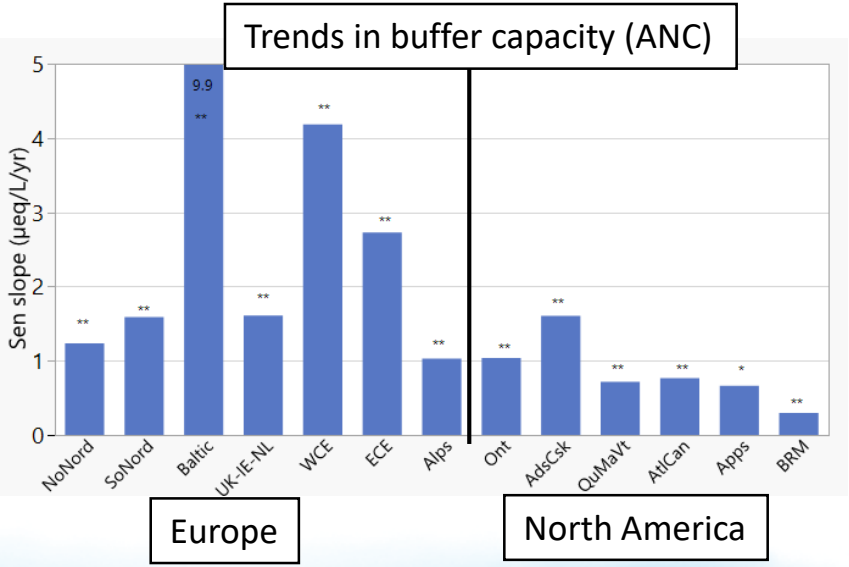


Reduced emissions of S and N lead to:

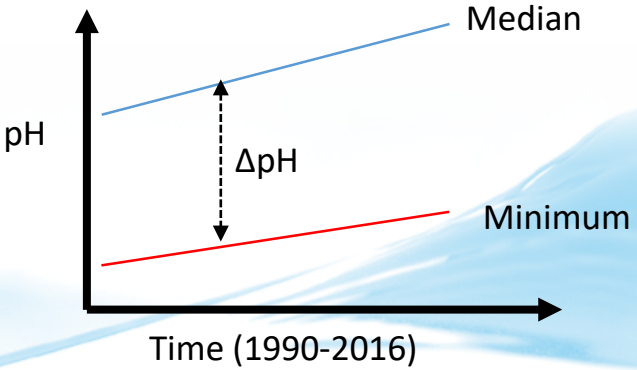
- Strong declines in sulphate in lakes and rivers, most clearly in Europe
- Declines in nitrate in lakes and rivers, although climate confounds these patterns

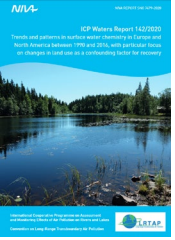


Trends in water chemistry - 2

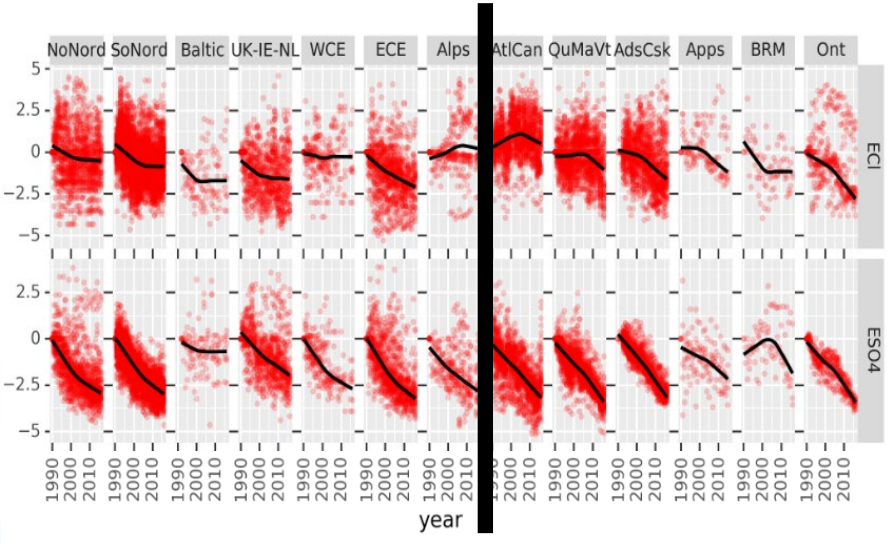


- Widespread increases in acid-neutralizing capacity and pH of lakes and rivers
- Episodic acidification has become less severe

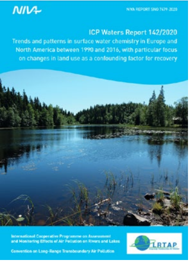




Trends in water chemistry – 3



- Rates of decline in SO4 are changing
  - Note the difference in trend between Europe and North America
- Most likely related to changes in deposition



NIVA REPORT SNO 7479-2020

ICP Waters Report 142/2020

Trends and patterns in surface water chemistry in Europe and North America between 1990 and 2016, with particular focus on changes in land use as a confounding factor for recovery

International Cooperative Programme on Assessment and Monitoring Effects of Air Pollution on Rivers and Lakes

Convention on Long-Range Transboundary Air Pollution

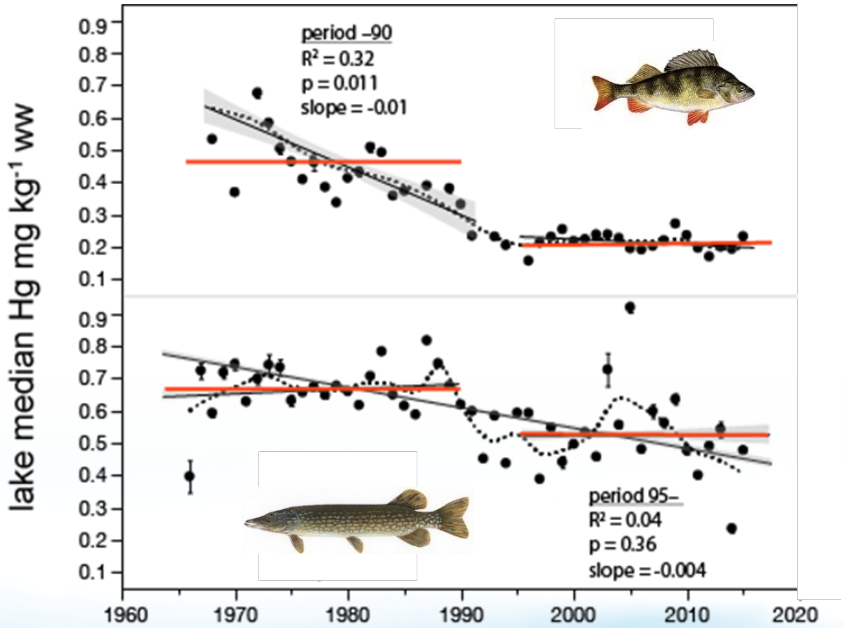
Trends in water chemistry - 4

- Time series of circa 500 lakes and rivers in Europe and North America (1990-2016) document improved water chemistry, which implies improved conditions for fish and other aquatic life
- Land use and climate (forest management, forest dieback from bark beetle attacks) can delay chemical and biological recovery

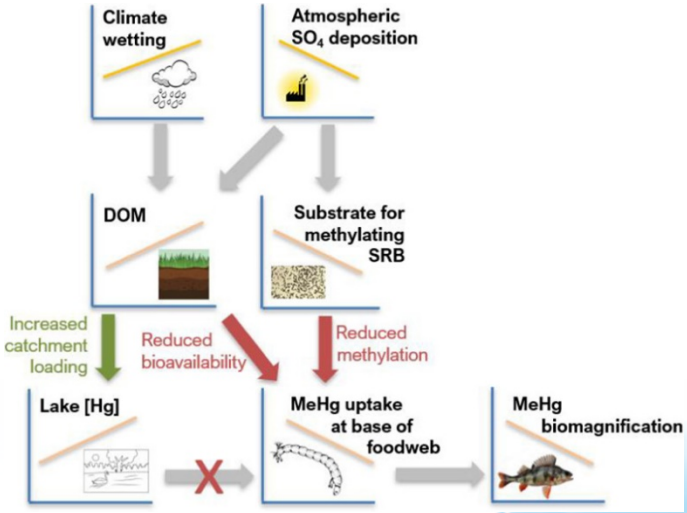
Atlantic Salmon © Neil MacIntyre

Caddisfly

Mercury in fish – affected by emissions of sulfur?



Braaten et al 2019, ES&T

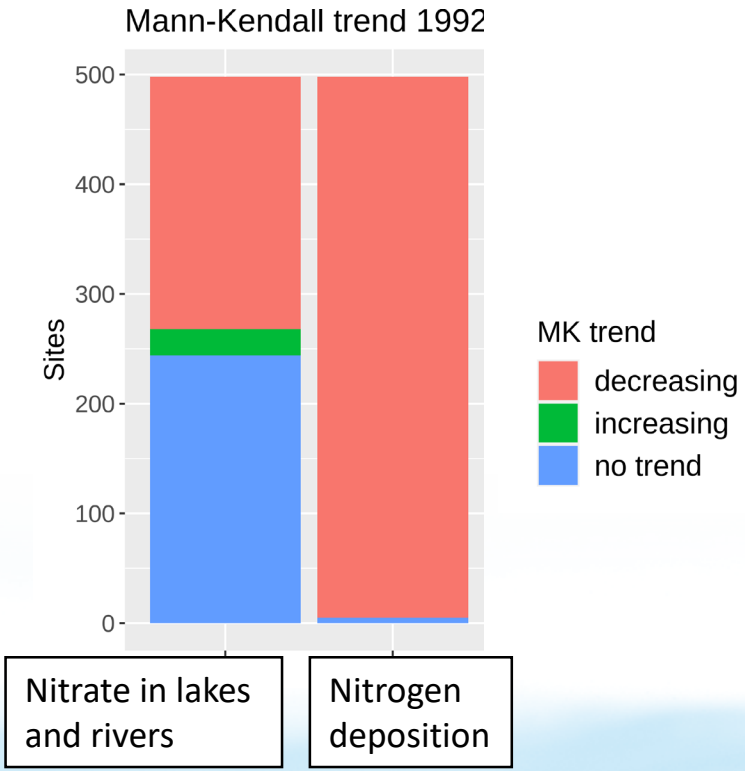


Braaten et al 2020, Stoten

Nitrogen report (ongoing)

- Nitrate trends are mostly negative, but smaller than trends in sulphate
- Possibly because declines in N deposition are smaller than declines in S deposition
  - The nitrogen cycle is sensitive to climate and land use change (more than the sulfur cycle)
- Update of empirical critical loads for nitrogen
  - Update of literature
  - Data analysis – looking for effects of nitrate on algal growth in freshwaters

Nitrogen report - 2



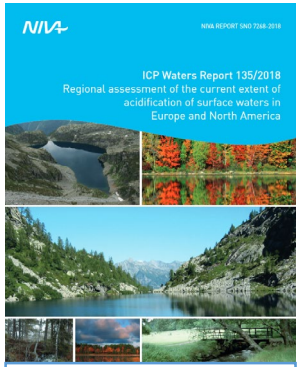
- Nitrogen deposition declines significantly
- Nitrate in surface waters does not show a simple response to deposition
  - Climate, land use and land cover all determine how surface waters react to changing N deposition
- Algal growth in lakes and rivers is mostly limited by phosphorus availability
  - Changes in nitrogen can impact algal biomass, productivity and algal blooms and species composition (diversity)

Review of Gothenburg protocol

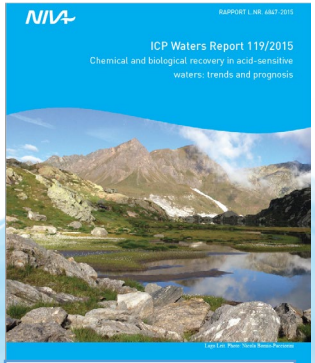
2.2b exceedance of critical loads

- Lack of critical load exceedance is not equivalent to 'no ecosystem damage' because of delays in recovery

- Regional assessment of current extent of surface water acidification in Europe and North America
- Trends and prognosis (for 2020)
  - Requires use of models and projections of deposition (collaboration withe EMEP)



ICP W report 138/2019



ICP W report 119/2015

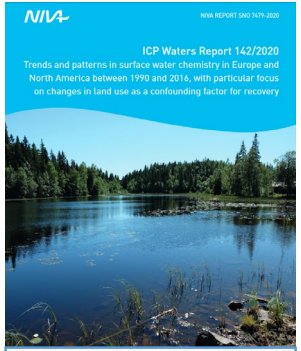
Review of Gothenburg protocol - 2

2.2c ‘change in water quality indicators’

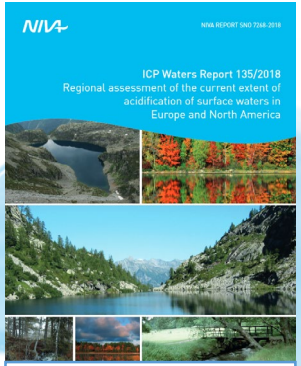
- Regular trend assessments, data until 2016

2.7 ‘is monitoring system sufficient’?

- Regional assessment of current extent of surface water acidification in Europe and North America
  - Lack of data in some regions. Monitoring under NEC directive might help



ICP W report 142/2020



ICP W report 138/2019

Review of Gothenburg protocol - 3

2.8 ‘protection of marine ecosystems’

- Not part of our mandate, but riverine export of nitrogen (originating from deposition) is clearly a relevant topic
  - Marine ecosystems are limited by nitrogen. Coastal ecosystems are especially sensitive to nitrogen inputs from rivers

Workplan 2020-2021

- WGE joint items
  - Review and revision of the Gothenburg protocol
  - Inputs to the Scientific Strategy
- ICP Waters specific
  - Contribution to empirical critical loads for nitrogen
  - Nitrogen report (2020+2021)