Importance of long-term monitoring of element fluxes from forests to surface waters

Leena Finér, professor
Natural Resources Institute Finland (Luke)

Contents

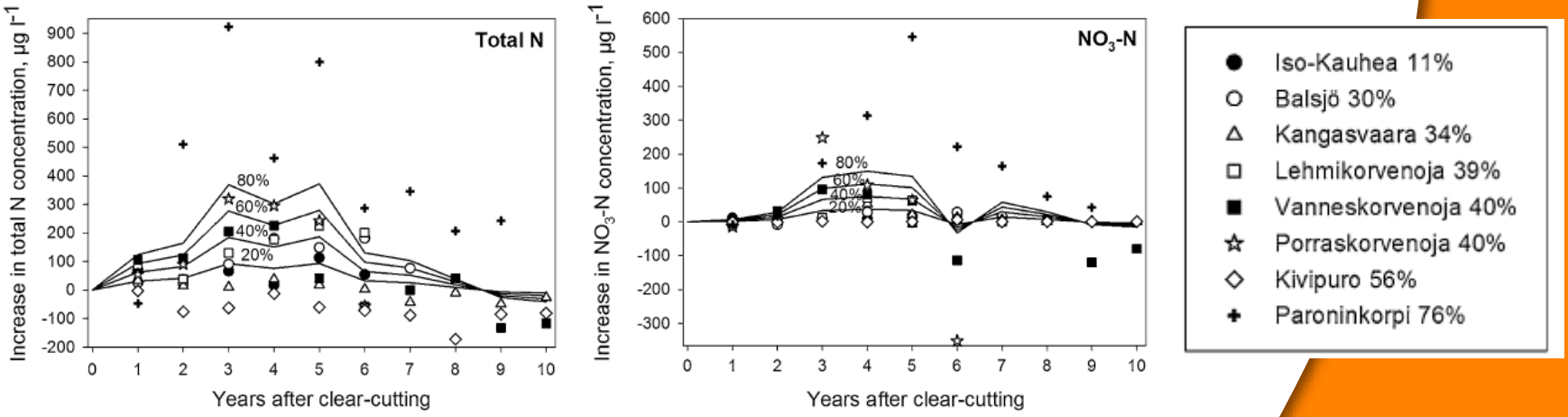
- Why long-term monitoring?
- Implementation and challenges of long-term monitoring

Photo: L. Finér

Why long-term monitoring of surface-water quality?

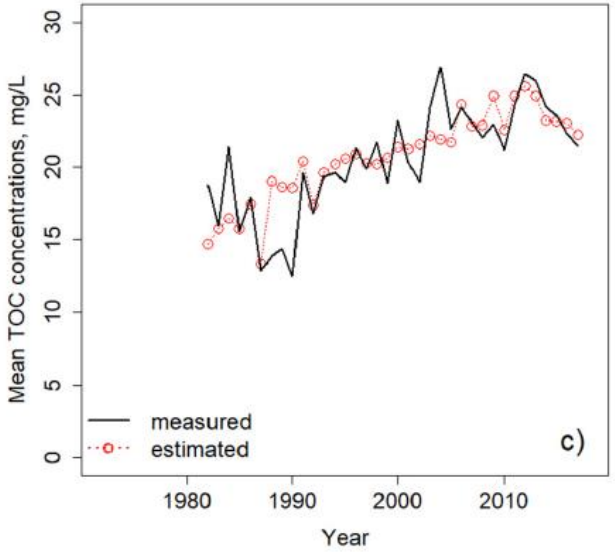
- Understanding the functioning of forest ecosystems
- Identification of the effects of:
  - Forest management practices
  - Environmental changes, air pollution, climate change …

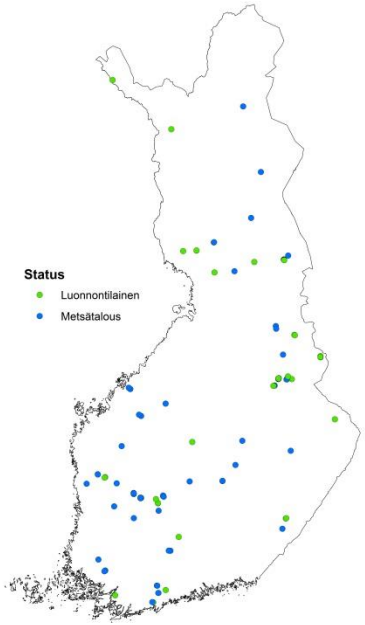
Effects last long, depends e.g. on the forest management practice and element in focus



Lines indicate model-predicted treatment effect when 20, 40, 60 or 80% of the catchment area is clear-cut. Palviainen et al. 2015; https://doi.org/10.1007/s 13280-015-0635-y.

Stream water quality responds slowly to climate change





Mean annual measured and estimated TOC concentrations in stream water. Data collected from 89 forest catchments in Finland. Finér et al. 2021; https://doi.org/10.1016/j.scitotenv.2020.144098.

Luke
NATURAL RESOURCES INSTITUTE FINLAND

Why long-term monitoring of surface-water quality?

- Understanding the functioning of forest ecosystems
- Identification of the effects of:
  - Forest management practices
  - Environmental change, air pollution, climate change …
- **Science based development of mitigation and adaptation strategies and methods to combat the negative effects**
- **Obligations from policy making and management**

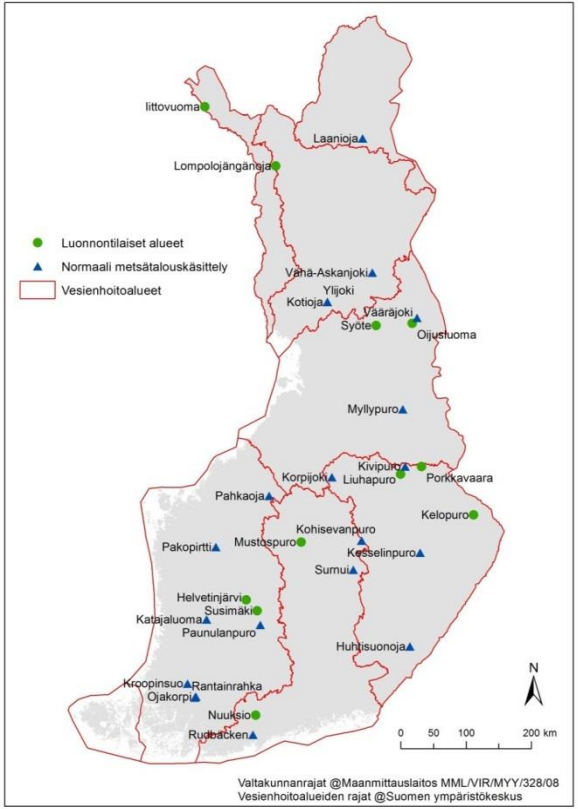
Luke
NATURAL RESOURCES INSTITUTE FINLAND

Implementation of long-term monitoring

National forest stream water quality monitoring network in Finland since 2014

10 pristine catchments ●

20 catchments with normal forest management ▲



https://metsainfo.luke.fi/fi/vesistokuormitukset

Aaltonen et al. 2021; https://doi.org/10.3390/w13172363

Luke
NATURAL RESOURCES INSTITUTE FINLAND

Implementation of long-term monitoring

- Definition of clear objectives with the end-users of the results
- Good design – selection of sites, parameters and time intervals of the monitoring, all in line with the objectives
- Quality assurance in field, laboratory and office
- Organization of data storage and open access
- Producing the results: processing the data, statistical analyses and modeling, schedule for publishing
- Estimation of the costs and available resources

Luke
NATURAL RESOURCES INSTITUTE FINLAND

Challenges of long-term monitoring

- Changes in operating environment – development of new methods, relevance of monitored parameters, need for re-design
- Long-term commitment of scientists, funding bodies and end-users of the results
- Monitoring results need to be transferred to action – communication between scientists, policy makers and managers


Thank you!