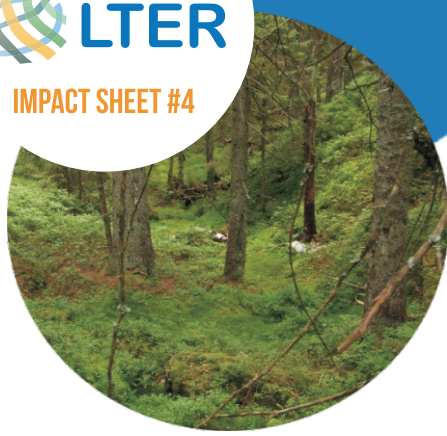
KINDLA LTER SITE AND CRITICAL ZONE OBSERVATORY (CZO)

LTER NETWORK, SWEDEN

LTER

IMPACT SHEET #4



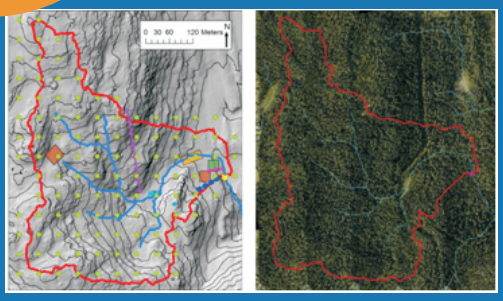
The Kindla monitoring site is a forested reference area used for continuous environmental monitoring under the Convention on "Long-range transboundary air pollution – LRTAP 1979" UN ECE CLRTAP, belonging to the international Integrated Monitoring network of similar sites. Kindla is also a node in the LTER and Critical Zone Observatory networks.

Integrated monitoring of natural forest ecosystem is carried out for identification of impacts from climate, air pollution and other general pressures. The monitoring program includes ecosystem studies with a catchment approach with determinations of hydrological and chemical budgets as well as effects on biota, primarily the vegetation and studies of ecosystem processes. The aims are to collect relevant background data from reference areas that can be used to separate anthropogenic disturbance of the ecosystem from natural variation.

Model simulations for prognoses of future environmental status are an important part of the program.

RESEARCH

The Kindla LTER site is included in the 933 ha large nature reserve Kindla established in 1999 and which also is a Natura2000 area. The area belongs to the Swedish region Bergslagen being a low hill region with some higher hill peaks. The region is dominated by coniferous forests together with wetland forests and mires.

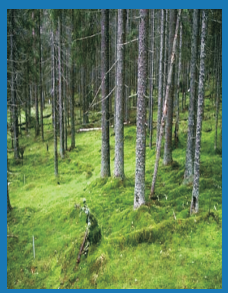


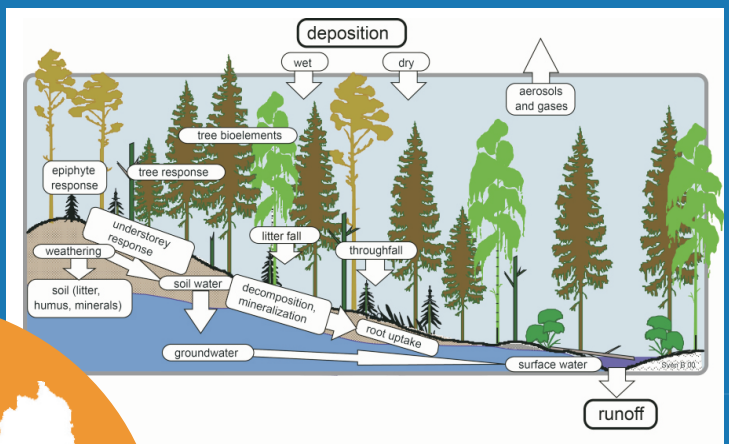
The catchment with installations & an air photo of the forest stands.

The Kindla catchment is dominated by over 100 year old Vaccinium myrtillus type of spruce (Picea abies) forest, on relatively steep slopes with morainic soils. Some parts are moist providing over 20% occurrence of wet spruce forests. A small mire is included in the catchment.

In earlier centuries, the forest was utilised for timber and charcoal production, but has been unmanaged over the last century resulting in a ongoing transition from post-management succession to internal gap dynamics with dieback of old trees.

MONITORING VARIABLES FEEDING THE CAUSE-EFFECT ANALYSIS IN FLUX APPROACH





The figure illustrates monitoring variables aiming to achieve a cause-effect & cross-media flux approach including atmosphere, forest vegetation, soils, soil, groundwater & runoff compounds.

KINDLA LTER & CRITICAL ZONE OBSERVATORY, SWEDEN

AIMS

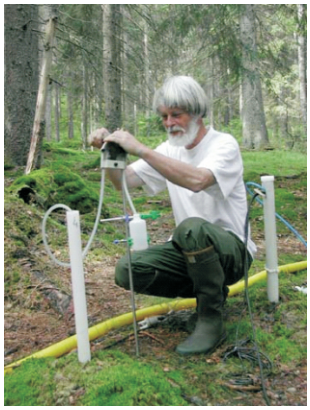
- Identification of impact from climate, air pollution and other human and other human and natural pressures on spruce forests;
- Providing a reference line for forest ecosystems studies, especially differenciation between anthropogenic disturbances and natural variarions;
- Modelling of responses of forest ecosystems to disturbances.

OUTCOME - IMPACT

- Monitoring at Kindla site has contributed to describing of soil and water acidification processes;
- It helped to define the reasons of delayed surface water recovery as an effect of stored sulphur release;
- The impacts of nitrogen deposition in forest ecosystem explained decrease of oligotrophic plant cover.
- A environmental hazard related to mercury being methylised and leached to surface waters has been identified.

COORDINATOR: SWEDISH UNIVERSITY OF AGRICULTURAL SCIENCES, CONTACT: LARS LUNDIN, LARS.LUNDIN@SLU.SE

VEGETATION & FOREST STAND



GROUNDWATER SAMPLING

DISCHARGE STATION

PRIORITY THEMES

BIODIVERSITY

WATER

PRODUCTION

SERVICES

INNOVATION

PLANNING / MANAGEMENT

SOCIETY

RESILIENCE

OTHER?

PRIORITY ECOSYSTEM SERVICES

PROVISIONING

REGULATING

WATER, NUTRIENT, CLIMATE REGULATION

CULTURAL

SUPPORTING

NUTRIENT CYCLING, HABITATS

AREA OF RELEVANCE, ACCORDING TO SDG

SDG - UN SUSTAINABLE DEVELOPMENT GOALS

FURTHER INFORMATION

Löfgren, S. et al. Recovery of soil water, groundwater and streamwater from acidification at the Swedish Integrated Monitoring catchments. Ambio (2011) 40, 836-856. Doi; 10.1007/s13280-011-0207-8, ISSN 0044-7447

Swedish IM site: http://www.slu.se/institutioner/vatten-miljo/miljoanalys/integrerad-monitoring-im/
International IM program: http://www.syke.fi/nature/icpim

PROJECT - EUROPEAN LONG-TERM ECOSYSTEM AND SOCIO-ECOLOGICAL RESEARCH INFRASTRUCTURE
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