



Photo: Anders Järnmark/Myra



# National Inventory of Landscapes in Sweden



- The National Inventory of Landscapes in Sweden (NILS) is a new, nationwide environmental monitoring programme focused on biodiversity.
- NILS includes all terrestrial environments in Sweden; agricultural land, wetlands, urban environments, forests and mountains.
- Results from NILS are used for following up the national environmental objectives. Land use status and change as well as the distribution and area of different biotopes are some examples of what is studied.
- Data collection is performed using aerial photo interpretation as well as field inventories.
- The programme commenced in full scale during 2003.

## Current activities

The first landscape squares were photographed during the summer of 2002 and interpreted during the following winter. Field work commenced during the summer of 2003. During the first years, the NILS programme will be developed further to include methods for monitoring e.g. insects, meadows and pasturelands, alpine screes as well as parts of the Natura 2000 monitoring programme.

The initiator of the programme is the Swedish Environmental Protection Agency, which also provides funding. The programme has been developed primarily by staff from the Swedish University of Agricultural Sciences (SLU) and from Umeå University. Experts and representatives for the National Board of Housing, Building and Planning, the Swedish Board of Agriculture, the Swedish Environmental Protection Agency, the National Heritage Board, the

National Board of Forestry, Statistics Sweden, the Swedish Biodiversity Centre, the Swedish University of Agricultural Sciences, Stockholm University, and County Administration Boards have provided support in the form of a reference group.

## Cooperation

Methods for aerial photo interpretation were developed in close cooperation with the department of Physical Geography and Quaternary Geology at Stockholm University. Discussions have taken place with the National Heritage Board on matters concerning cultural heritage. NILS has also been in contact on a regular basis with its Norwegian counterpart, 3Q, as well as with other similar programmes in European countries. In an ongoing cooperation between NILS and the Swedish breeding bird survey, NILS provides the survey with biotope data.

### Desired information from NILS

NILS meets the demands made by authorities, NGO's, scientists etc. by increasing our knowledge within the following areas:

#### Agricultural environment:

- meadows and pastures
- management by grazing and mowing
- small biotopes, streams
- composition of the cultivated landscape
- occurrence of certain species

#### Urban environment:

- green areas
- old deciduous trees and fruit trees
- small biotopes (streams, parks)
- recreational areas

#### Wetlands and riparian zones:

- draining
- natural or regulated water regime
- management by grazing and mowing
- ground disturbance and exploitation
- occurrence of certain species

#### The forested landscape:

- disturbance processes
- landscape composition
- stand characteristics
- important habitats, e.g. dead trees
- occurrence of certain species

#### Mountain environments:

- effects of reindeer husbandry
- climate change
- occurrence of certain species

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SWEDISH ENVIRONMENTAL PROTECTION AGENCY

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# NILS monitors

# landscape dynamics

*The National Inventory of Landscapes in Sweden (NILS) is a new nationwide programme for monitoring changes in the Swedish landscape, and how these changes affect the prerequisites of biodiversity. Funding for NILS is provided by the Swedish Environmental Protection Agency as a part of the national environmental monitoring work.*

**N**ILS is the first Swedish inventory programme that includes all terrestrial environments. Agricultural land, forests, wetlands, riparian zones, mountains as well as urban environments are inventoried. Information from NILS contributes to our understanding of how man's use of nature affects biodiversity. Results show the state of, and changes in, the distribution and area of different biotopes in the landscape as well as the occurrence of different small-scale features and landscape elements such as ditches, stone walls and solitary trees. The inventory also includes the occurrence of individual species. NILS covers the effects of land use change, where results are implemented for prognostication and consequence assessments.

## Environmental objectives

Following up the national environmental objectives is an important aim of the NILS programme. NILS provides figures for international reports as well as for other monitoring programmes. Data are also used in environmental research.

- NILS comprises inventories of:
- landscape composition
  - biodiversity
  - aspects of cultural heritage
  - Natura 2000 biotopes

The inventories are performed using both aerial photo interpretation and field-based methods.

## Landscape composition

Human impact on the landscape affects biodiversity both positively and negatively. NILS captures changes in the landscape regarding the occurrence of biotopes and their proximity to each other. This reflects the prerequisites for biodiversity. Some examples of what is being monitored are the effect of the forestry sector on the landscape, conservation consideration, the effects of land use change on agricultural land, management of meadows and pastures, erosion, as well as exploitation of the physical environment.

*After 3D-interpretation is performed on the computer, images are saved in a geographic information system (GIS).*



Photo: Peter Lindström/SLU

## Biodiversity

The NILS programme examines prerequisites for the existence of various species. This is accomplished by inventorying the large-scale composition of the landscape and important biotopes and habitats such as dead trees, stone walls, bushes as well as vegetation in edge zones, roadsides and ditches. In addition to these aspects, NILS also includes inventories of certain plant and animal species.

## Aspects of cultural heritage

Traditional land use methods together with natural processes have formed the landscape as we see it today. For this reason, traces of traditional land use methods can help us understand the development of the landscape. Traditional land use, such as wetland hay-making, forest grazing and traditional cultivation, is of great importance for biodiversity.

*A detailed vegetation inventory is conducted within a circular plot (0.25 m<sup>2</sup>).*



Photo: Sture Sundquist/NILS

## The NILS work routine

NILS covers all biotopes within the framework of a nationwide sample, comprised of about 600 permanent squares (5 x 5 km) that are inventoried every 5 years. This implies that about 120 squares are inventoried each year across the country. The NILS programme will also offer authorities, county administration boards and other regional customers the opportunity to increase the number of squares within a region, and thus obtain regional level data.

## Aerial photo interpretation

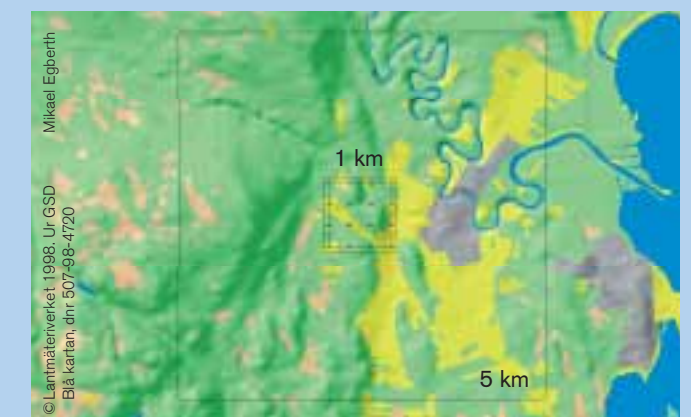
Landscape composition and structural changes are large-scale characteristics that are difficult to observe from ground level. However, analysis is facilitated by the use of infrared aerial photos. A general interpretation and digitisation is performed in each NILS square. As the many different biotopes are registered a clear picture of landscape structure and composition appears. Within the central 1x1 km in each NILS square a more detailed interpretation and digitisation of landscape elements and biotopes is performed (see the figure below). By using and analysing historical maps an opportunity is provided to follow the historical development of an area.

## Field-based measurements

The year after the aerial photographs of NILS squares have been taken and interpreted, several field crews go out to inventory the central 1x1 km squares for which detailed information has previously been obtained from photographs. The field inventories are performed partly to check the results from the aerial photo interpretation. In addition, objects, structures and species that cannot be detected or interpreted from aerial images are inventoried. About ten crews, with two persons in each, take part in the fieldwork, which is done between June and August.

## The choice of biotopes

Sweden is to a great extent a forested country. To be able to include agricultural land, wetlands, mountains and urban environments, the selection of square plots for NILS has to a certain degree been directed towards these non-forested biotopes. In predominantly forested areas the density of NILS squares is lower, as the RIS\* (a Swedish forest inventory) currently monitors forests.



*The 5 x 5 km landscape squares are randomly positioned across the country. Within an inner 1x1 km square field measurements are made on systematically placed plots (circles). The inventory of ditches and forest edges is done using additional methods, so called line intercept and strip surveys.*

\* The Swedish National Inventory of Forests (RIS) is a common name for the combined forest inventories of the National Forest Inventory and the Swedish Forest Soil Inventory.

Photo: Mats Gerentz/SLU

Photo: Per-Anders Esseen/NILS