RESEARCH AND DEVELOPMENT

The NFI is developed continuously in order to better meet the changing information needs of the forestry sector and other information users. For example, new measurements on the biological diversity of the forests were included in NFI9.

The NFI10 includes further major changes. For example, it applies 'rolling' inventory system, in which one fifth of the sample plots are measured each year in the entire country. Country level and region level estimates will be up-dated annually.

The reliable results of the NFI are based on continuous research, methodological development and product development. The current research topics include:
- Estimation and error estimation methods for forest inventory
- Multi-source (MS) inventory methods
- Planning of inventory design by means of satellite image based thematic maps
- Continuous updating of NFI information by means of remote sensing data
- Estimation of the forest carbon budget
- Biodiversity assesment and monitoring methods
- Landscape ecology of boreal forest

NFI - contacts

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Finnish Forest Research Institute – Metla

builds the future of the forest sector through research. Metla conducts research and generates research information about the forest nature and environment, the different uses of forests, and about forestry and the forest cluster. Metla has two research centres, seven research stations and a network of research forests located all over Finland.

More information about Metla's research activities and research results, services and products:

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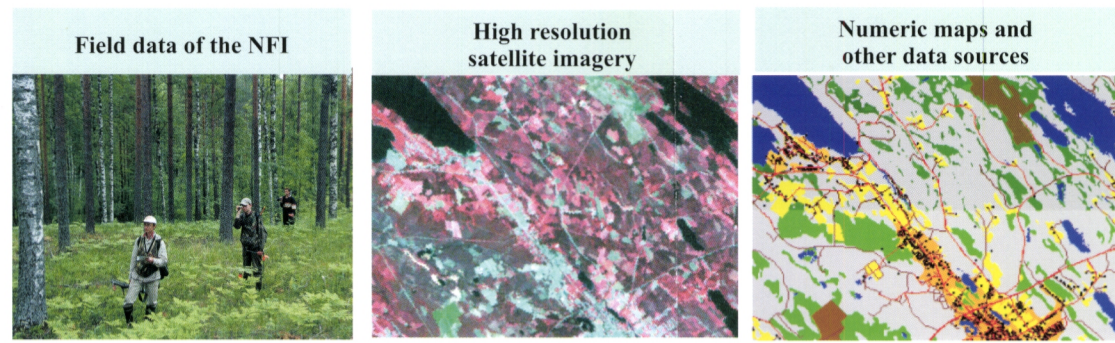www.metla.fi

METLA
FINNISH FOREST RESEARCH INSTITUTE

National Forest Inventory (NFI)

SUOMI

ENGLISH

Multi-Source National Forest Inventory

MULTI-SOURCE INVENTORY – DATA SOURCES AND METHOD

Field data of the NFI

High resolution satellite imagery

Numeric maps and other data sources

Processing

Statistics

Thematic Maps
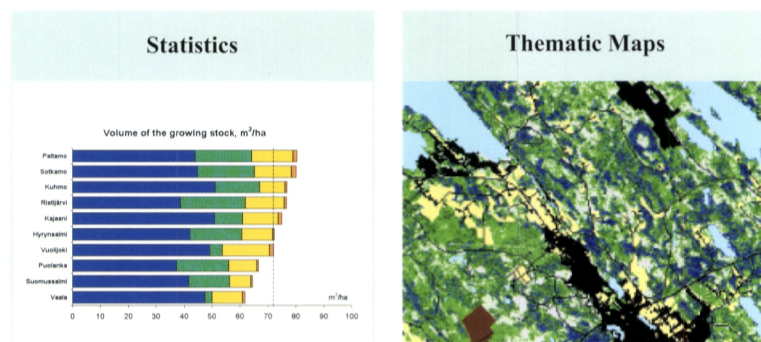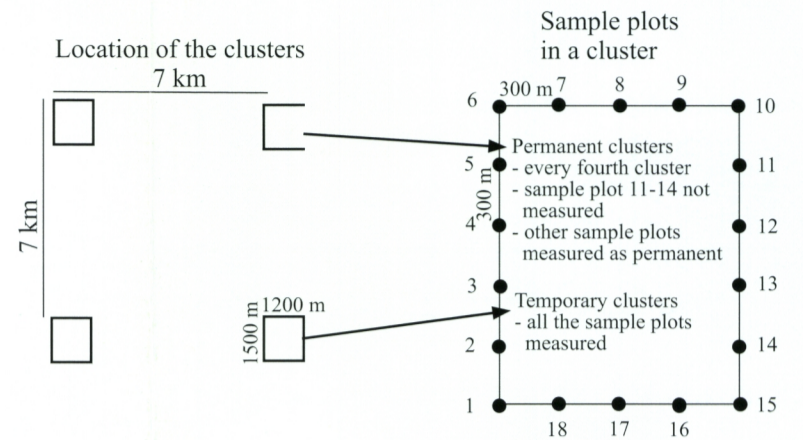
- Multi-Source National Forest Inventory (MS-NFI) produces accurately geo-referenced information for smaller areas than can be obtained using only field measurements
- The method exploits field information, satellite image data and digital map data, such as land-use maps and digital elevation models
- Non-parametric k nearest neighbour estimation method is applied in image analysis
- All inventory variables can be predicted for each image pixel
- Thematic maps and statistics can be produced for any given area
- Non-paremetric multi-source inventory method is adaptable to and is in use or has been tested in different bioclimatic regions and with different remote sensing material

PRODUCTS AND SERVICES OF THE MS-NFI

Statistics on forest resources at municipal level
- Land use classes, volume and structure of the growing stock
- Distribution of age and development classes of stands, dominance of the species
- Additional themes upon request

Forest information on thematic maps
Forest related thematic maps for desired forest areas are provided in digital form and as paper prints of an arbitrary scale upon customer request. Thematic maps can be combined with other geo-referenced data and used for various purposes in forestry.
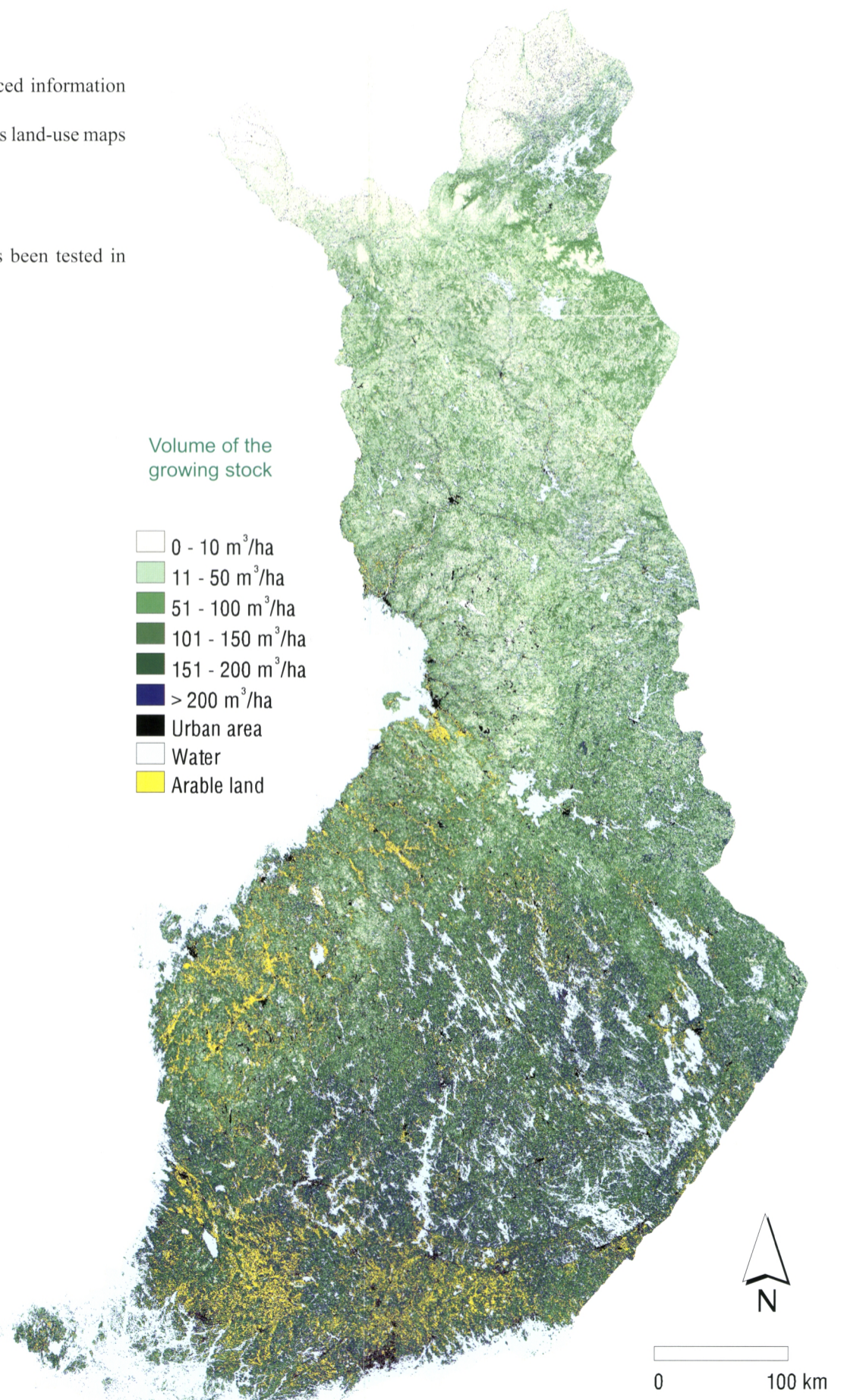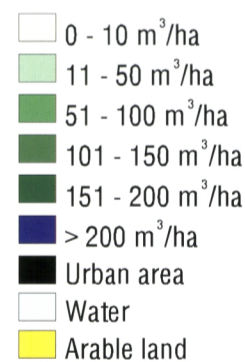
Themes:
- Mean volume of growing stock, m³/ha
- Mean volume of growing stock by tree species, m³/ha
- Volume of saw logs by tree species, m³/ha
- Volume of pulpwood by tree species, m³/ha
- Mean volume by dominant tree species, m³/ha
- Dominant tree species
- Age structure of stands

Customer services and consulting
- Consulting services related to forest inventory systems
- Statistics, thematic maps and expert analysis tailored for different topics and geographic regions

FIELD MEASUREMENTS

Sampling design of the NFI9 in Central Finland

Location of the clusters

Sample plots in a cluster

Permanent clusters
- every fourth cluster
- sample plot 11-14 not measured
- other sample plots measured as permanent

Temporary clusters
- all the sample plots measured

Distance between two field plot clusters, and the size and the shape of the clustermvary regionally. In NFI10 the location of temporary clusters has been shifted and number of plots per cluster is slightly reduced. The measured trees are selected using Bitterlich basal areal sampling.

Field measurements provide reliable, unbiased results for large area (over 200,000 ha) and for the whole country. For example, the sampling error of the total timber volume in Finland is 0.6%.

Volume of the growing stock

- 0 - 10 m³/ha
- 11 - 50 m³/ha
- 51 - 100 m³/ha
- 101 - 150 m³/ha
- 151 - 200 m³/ha
- > 200 m³/ha
- Urban area
- Water
- Arable land

0   100 km

FINLAND'S
NATIONAL FOREST INVENTORY

For over 80 years, the Finnish National Forest Inventory (NFI) has produced reliable information concerning national and regional:
- forest resources – volume, growth and quality of the growing stock
- land use structure and forest ownership
- forest health and biological diversity of forests
- forest carbon stocks and changes.

History
- The first NFI was in 1921–24
- Linewise survey sampling employed until NFI4 (1960–63)
- Detached field plot cluster used since NFI5 (1964–70)
- Introduction of the first satellite image aided operative NFI in 1990
- NFI9 in 1996–2003
- The NFI10 (a rolling inventory) started in 2004

VMI10 (2004-2008) new features:
- cycle intensified to 5 years
- field plots measured in the whole country in each year
- country level statistics produced biannually
- Forest Center level base line statistics every 3rd year
- improved assessment of silvicultural status
- remeasurement of the permanent plots establishded in NFI9 will produce new information of changes in forest environment
- 40–50 temporary field workers.

Field measurements of the NFI in 1930's (NFI2).

FIELD MEASUREMENTS
– BASE OF THE INVENTORIES

Extensive field measurements form the base of the national forest inventory. For example in the NFI9 were measured:
- Over 66,000 field plots on forestry land (NFI9)
- Over 150 characteristics measured or assessed
- Half a million tallied tree
- Every 7th tally tree was measured in more detail for assessment of volume, growth, health and timber assortments.

One fifth of the field sample plots are permanent. Remeasurements of the permanent sample plots provide additional information about the changes taking place in the forests and forest nature.


NFI PROVIDES INFORMATION FOR

- Forest policy making in national and international levels (statistics, inputs for forestry programmes)
- Regional and national forest management planning
- Planning of forest industry investments
- Assessing sustainability of forestry
- Biodiversity, forest carbon budget, forest certification
- Timber procurement of forest industry
- Research

The results of the NFI are published e.g. in Metla's publications, in seminars and articles etc.

TIMBER RESOURCES
AND FOREST GROWTH IN FINLAND

Estimates of timber resources, forest growth and its annual variation are important results of the NFI.

Annual total increment and drain
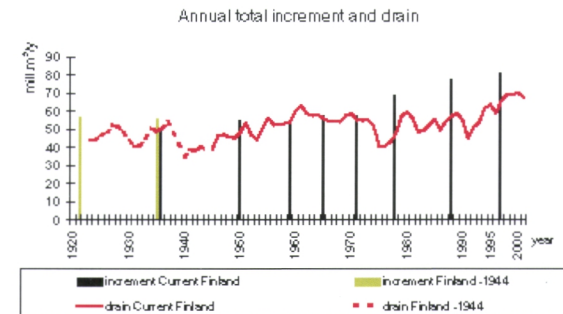
The volume of growing stock in 2002 was 2050 million m³ and its annual increment 83 million m³. Of the tree stem volume 47% was Scots pine, 34% Norway spruce, 15% birch and 4% other broadleaved trees.
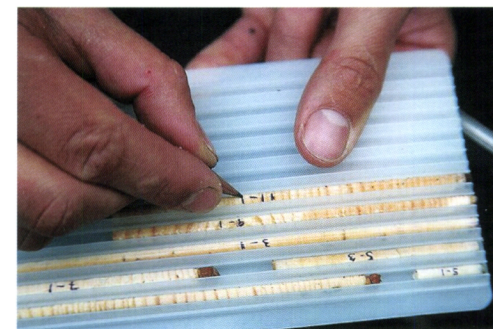
The bore cores of the sample trees are sent to a laboratory where the age and increment are measured from annual rings.