

Big Databases in forest planning and operations

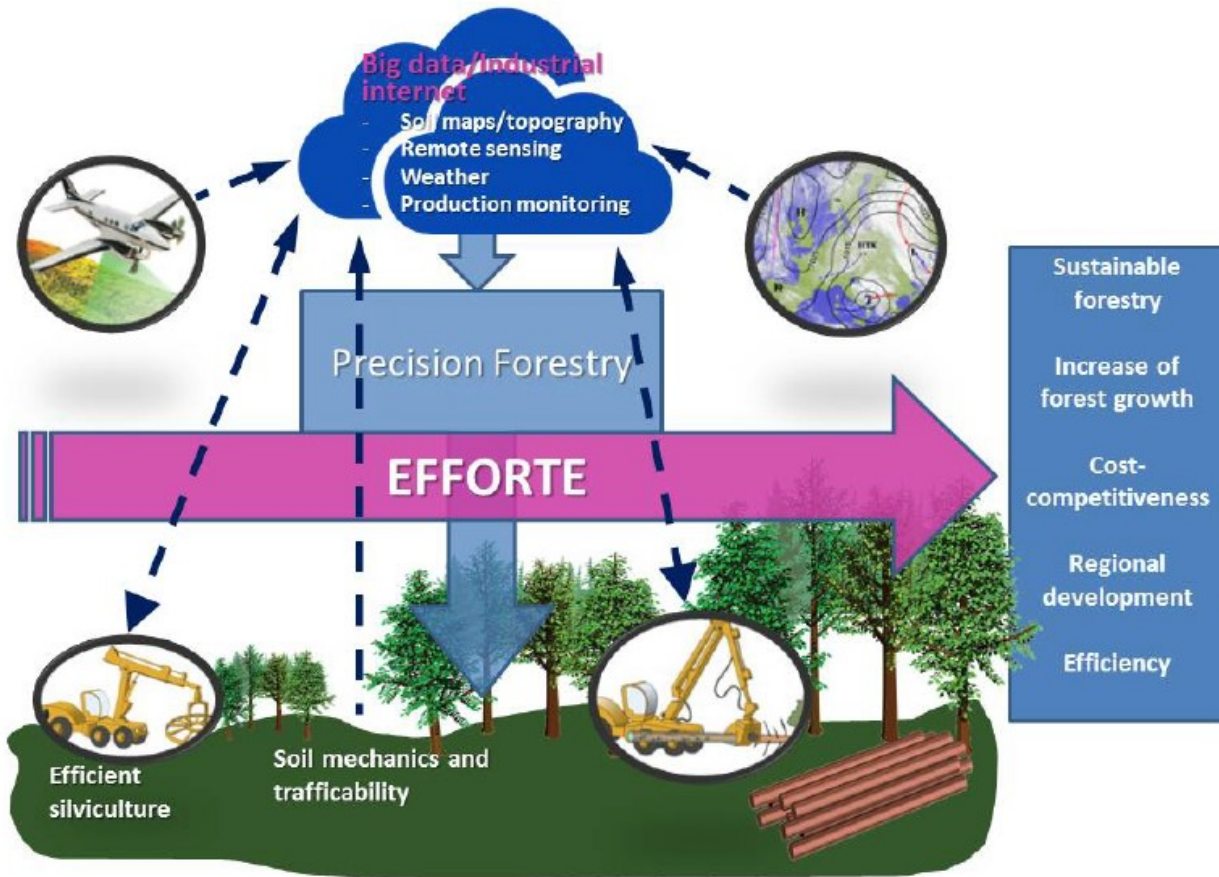
– New national lidar campaign in Sweden

NB-Nord workshop



Erik Willén

Process Manager Digitalization



Main research partners:

- LUKE (FI)
- Metsäteho (FI)
- Skogforsk (SE)
- SLU (SE)
- FCBA (FR)
- Runs 2016-2019
- <https://www.luke.fi/efforte/>

Fig.1.3.a EFFORTE targets at efficiency and sustainability of forestry.

Mapping and SWOT analysis of existing and future Big Data sources

- Focus forest planning and wood supply
- Database inventory in SE, FI and FR
- Comments on coverage, update frequency, availability and quality
- Country-specific SWOT analysis
- Conclusions

Category	Example of data sources	Specific features
Remote sensing	Earth Observation data, aerial imagery, lidar data, UAV	Raster data or point clouds
Elevation and surface models	Digital elevation models, Digital surface models	Raster data
Map data	Topographic maps, soil maps, cadastral data, wet area maps	Raster or vector data. Complete coverage
Thematic databases	Road databases, Protected areas, Natura2000-sites, cultural heritages	Vector data, partial coverage
In-situ data	Field measurements, forest stand databases, harvester and forwarder data,	Fully or partially collected in field
Meteorological data	Weather data, forecasts	
Forest estimates	Estimations of forest parameters such as basal area, mean diameter or forest volume. Based on remote sensing.	Raster data
Statistics	transportation statistics, industry demand, forest statistics	Restricted access for some statistics

Example SWOT Sweden

Strengths <ul style="list-style-type: none">- Many data sources available and easy accessible- Some decision support on trafficability implemented – acceptance by users- Focus in forestry in decision support – interest to further develop and implement	Weakness <ul style="list-style-type: none">- Relatively high costs on detailed Big Data sources- GNSS in forest machines can be rather poor- Soil maps and Met office data not developed for forest operations
Opportunities <ul style="list-style-type: none">- Many Big Data sources coming- Improved tools for Big Data Analytics- Crowdsourcing may support data collection- Support from investors and research community on Big Data data and processing methods	Threats <ul style="list-style-type: none">- Too much variation in data quality reduce the reliability of the decision support or models- Models that require data with restricted access (such as private data) may not be developed although data quality is high- New technology may not deliver useful results

Identified key datasets for Efforte objectives

Existing

- Detailed DEM (1-2 meters)
- Lidar derived forest estimates
- Road databases
- Forest machine data

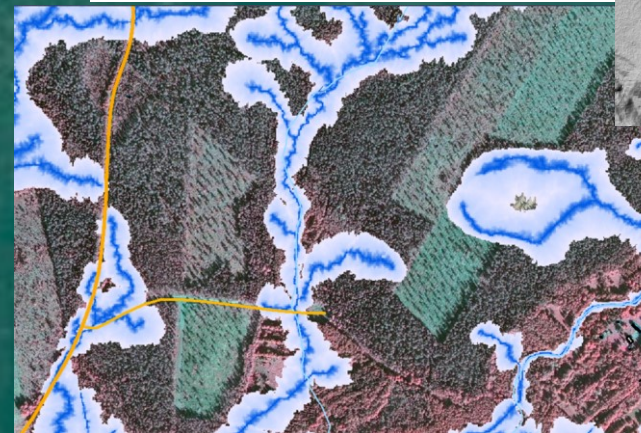
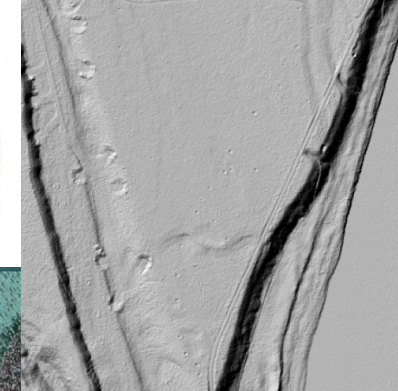
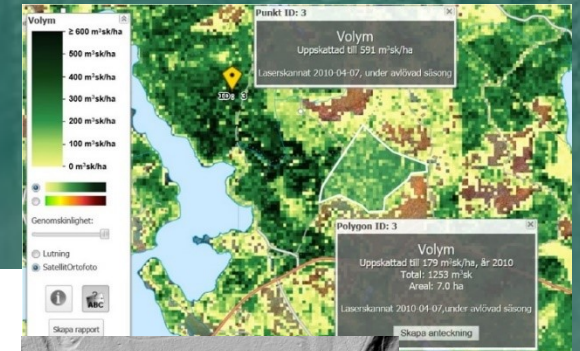
Future

- Updated more detailed soil maps
- Weather data and models
- Forest machine data
- Mobile laser scanner

New nationwide lidar campaign in Sweden

State funded forest estimates from lidar data 2013-2015

- ❑ Very successful
- ❑ Combine lidar for the new national DEM and NFI plots
- ❑ Objective nationwide mapping
- ❑ Now essential part of digitalization in forestry planning and operations



Geodata för skogliga ändamål
Skogsdatastrategin

Started in meetings with the government February 2017

Tiden går och det är hög tid att starta omdrevet. Om det ska ske på det mest kostnadseffektiva sättet så bör myndigheter och näringsliv samverka. Vi är beredda att bidra och aktivt delta i detta arbete om det startar omgående.



- New lidar campaign
- Important to start immediately
- The way forward – co-operation with agencies and industry

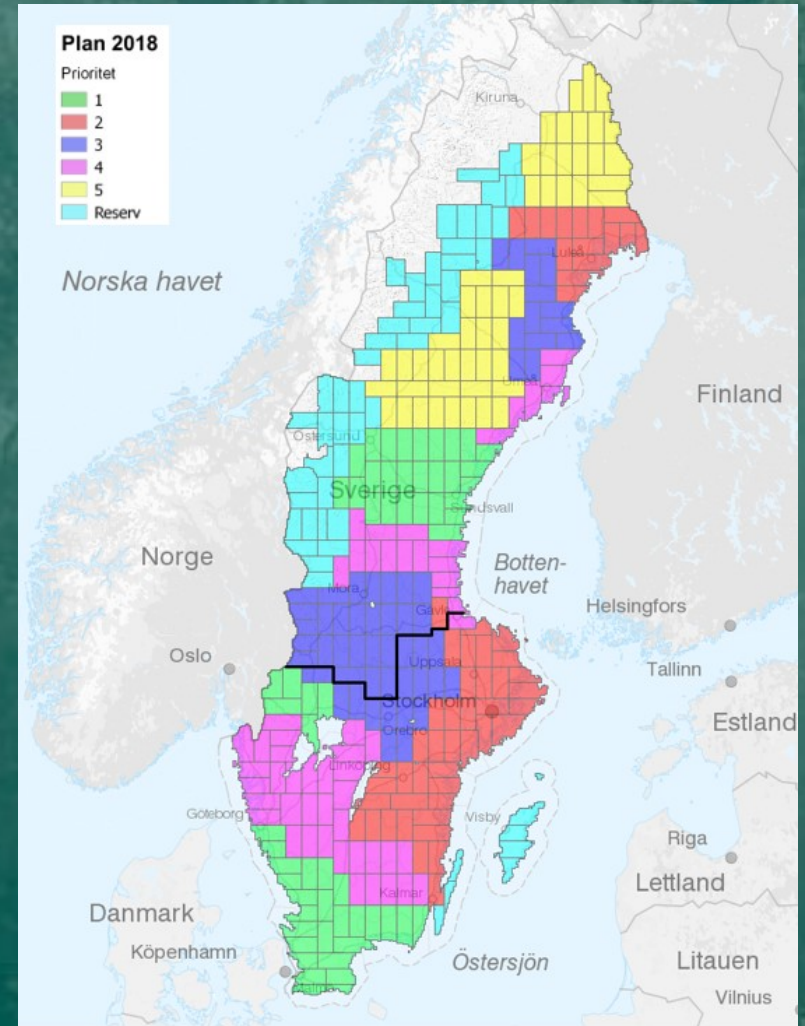
"We are prepared to support if the scanning starts immediately"

Common declaration from forest companies at the seminar 2017-02-07

**The forest grows and are managed
– Updating necessary**

Scanning status

- Started May 2018
- National funding of about 1 MEuro/year + possible co-funding from forest companies
- Cost about 21 Euro/km²
- Point density about 1,5/m²
- Forest estimates available about 6 months from scanning
- 7 Years revisit time if only public funding



New possibilities

What does new lidar data provide?

Enhanced DEM showing more details, e.g. Cultural heritage

Detailed tree height maps for forest planning



Forest growth

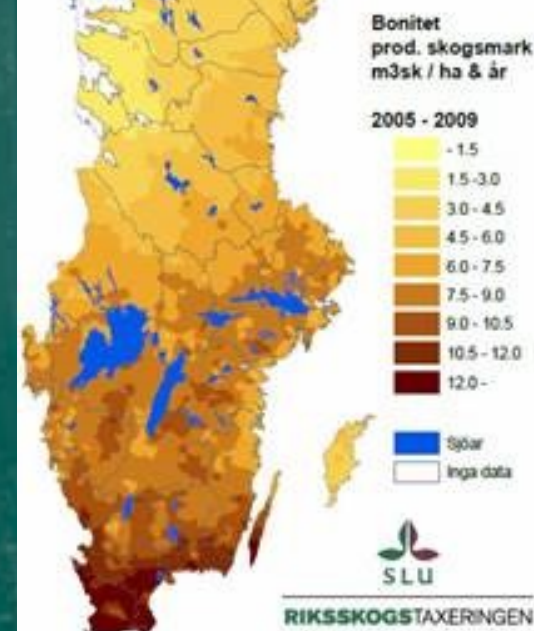
Two lidar derived datasets may provide forest growth maps on grid level



Bild: Mats Hannerz

Geodata för skogliga ändamål
Skogsdatastrategin

New possibilities



Rikskogstaxeringen

Using forest machine data with lidar estimates

New possibilities

- Yield estimates from harvester data using lidar estimates describing the standing forest
- Using harvester data as in-situ data in forest lidar estimates and include multispectral data for tree species mapping
- Updating of lidar estimates using harvester data



Summary

- Detailed datasets provide key decision support, e.g. detailed DEM and forest estimates from lidar or photogrammetry
- Detailed soil maps would support terrain transportation
- Establishment of systematic programs for lidar acquisitions key for forestry sector
- Great opportunities to combine forest machine data, detailed DEM and forest estimates for forest applications using e.g machine learning.