SLU

Department of
Forest Resource Management

Annual Report 2020

Contents

Dear Reader,

The Department of Forest Resource Management leads Swedish terrestrial environmental and resource monitoring through its environmental monitoring and assessment (EMA) activities, research and teaching. We provide different stakeholders with objective decision support for society's needs. For the sake of future generations, and ours, the decision support must be sufficiently comprehensive and of high quality.

Our EMA flagships are the Swedish National Forest Inventory and the National Inventory of Landscapes in Sweden, which monitor historical trends as well as the current situation, while the Heureka simulation system provides an insight into the future. Our research focuses on improving and streamlining monitoring (forest inventory and sampling, forest remote sensing, mathematical statistics applied to forest sciences) and providing information on managed and efficient use of natural resources in a broad sense (landscape studies and forest planning). We are proactive and strive to have a vision of which issues will be the most important ones in the future. In addition, our teaching aims to spread knowledge and secure the skills supply within and outside SLU. For this to succeed, our aim to have an efficient organisation where the support functions play an important part. The organisation is based on cooperating towards a common goal.

The year 2020 was a special working year due to a pandemic that significantly affected the workload and the working environment. Forced "working from home" was initially a rather positive experience, but as time went on, many colleagues experienced both physical and mental problems. I am extremely grateful for everyone's efforts under the circumstances, and the Working Group for Local Collaboration has offered heads of divisions and employees support in reducing the negative effects of the pandemic. Hopefully, we will take with us the positive experiences such as the realisation that online meetings are often an option, and that there are technical solutions that may prove useful in teaching.

During this past year, we have collaborated with the faculty in various contexts. Jonas Bohlin, Dianne Staal Wästerlund, Pernilla Christensen and Torgny Lind worked to improve the future MSc in Forestry degree programme. Eva Lindberg has played an important role in applying for examination rights for civil engineers. Work on the recruitment of a professor in forest remote sensing has been launched. The faculty also set up an AI group where Henrik Persson and Johan Fransson are involved.

A lot happened on the personnel side:

• Eva Lindberg was appointed senior lecturer at the Division of Forest Remote Sensing.
• Jakob Lagerstedt was recruited as a system engineer at the Division of Forest Remote Sensing.
• Raul De Paula Pires was recruited as a doctoral student at the Division of Forest Remote Sensing.
• Anders Lundqvist was recruited as a senior lecturer at the Division of Forest Resource Analysis.
• Per Sandström was appointed associate professor at the Division of Forest Resource Analysis.
• Maria Johansson was recruited as a project assistant in February, moved to a post as postdoctoral researcher in August, and finally to a post as researcher in December, all at the Division of Forest Resource Analysis.
• Benoît Gozé and Indu Indirabai were recruited as doctoral students at the Division of Forest Resource Analysis.
• Eva-Maria Nordström was appointed senior lecturer at the Division of Forest Planning.
• Teresa López-Andújar Fustel was recruited as a doctoral student at the Division of Forest Planning.
• Marcus Andersson and Marlene Lidén were recruited as environmental assessment specialists at the Division of Landscape Analysis.
• Lars Gunnar Marklund was recruited as an analyst at the Division of Forest Resource Data.
• Marcus Hedblom and Ljusk Ola Eriksson changed departmental affiliation.
• Mats Sandewall retired after about 36 years of faithful service.
• Hans Petersson, Per Nilsson, Jonas Fridman and Hampus Holmström were honoured with the Award for Zeal and Integrity in the Kingdom's Service for having served the government for 30 years.

We hope you will enjoy reading this annual report. Do not hesitate to contact us if you would like to find out more about the activities touched upon here – we would be more than pleased to share our knowledge and experiences with you.
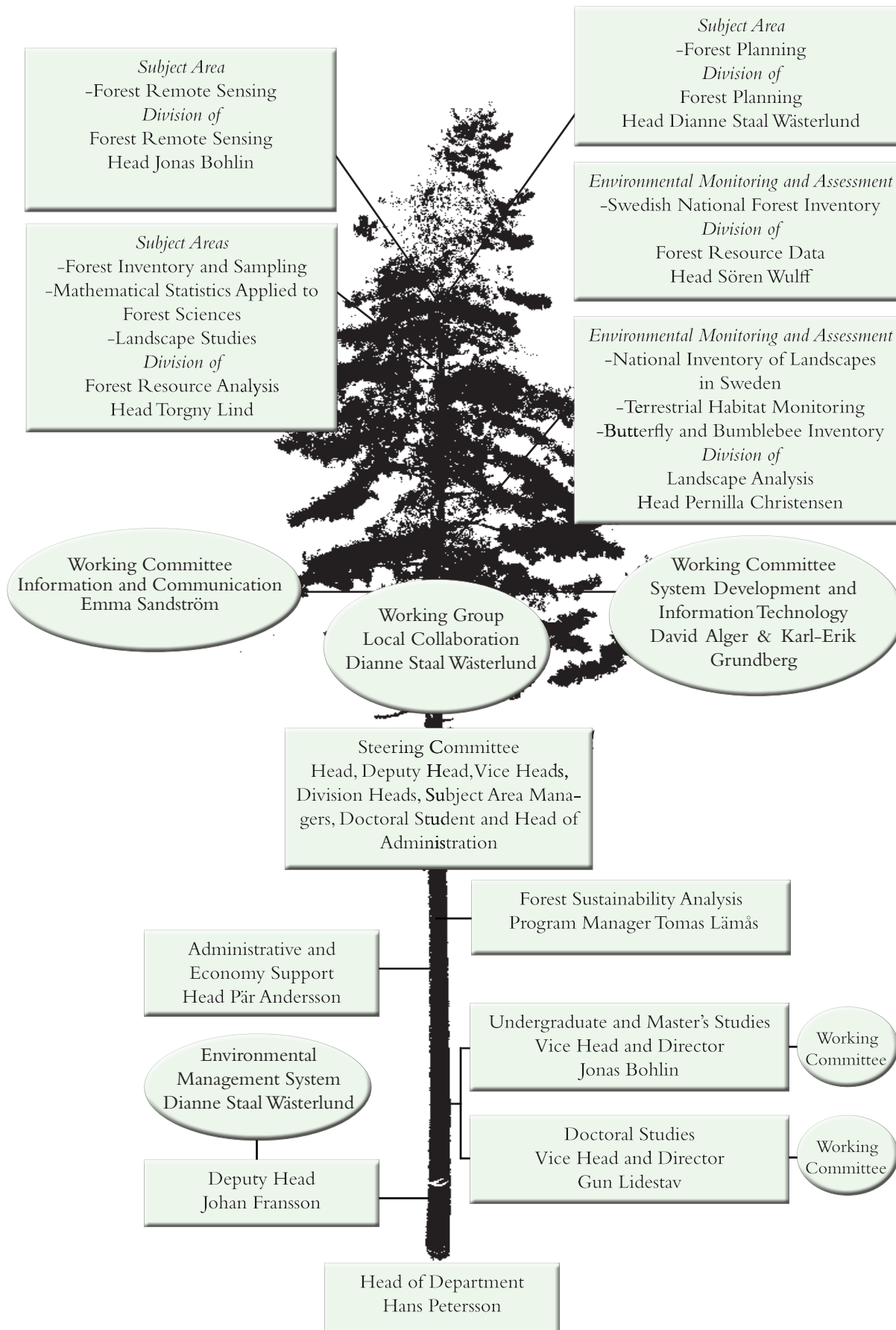
Hans Petersson
Head of Department

Organisation

Schematic View of the Department

Subject Area
–Forest Remote Sensing
Division of
Forest Remote Sensing
Head Jonas Bohlin

Subject Areas
–Forest Inventory and Sampling
–Mathematical Statistics Applied to
Forest Sciences
–Landscape Studies
Division of
Forest Resource Analysis
Head Torgny Lind

Subject Area
–Forest Planning
Division of
Forest Planning
Head Dianne Staal Wästerlund

Environmental Monitoring and Assessment
–Swedish National Forest Inventory
Division of
Forest Resource Data
Head Sören Wulff

Environmental Monitoring and Assessment
–National Inventory of Landscapes
in Sweden
–Terrestrial Habitat Monitoring
–Butterfly and Bumblebee Inventory
Division of
Landscape Analysis
Head Pernilla Christensen

Working Committee
Information and Communication
Emma Sandström

Working Group
Local Collaboration
Dianne Staal Wästerlund

Working Committee
System Development and
Information Technology
David Alger & Karl-Erik
Grundberg

Steering Committee
Head, Deputy Head, Vice Heads,
Division Heads, Subject Area Mana-
gers, Doctoral Student and Head of
Administration

Forest Sustainability Analysis
Program Manager Tomas Lämås

Administrative and
Economy Support
Head Pär Andersson

Undergraduate and Master's Studies
Vice Head and Director
Jonas Bohlin

Working
Committee

Environmental
Management System
Dianne Staal Wästerlund

Doctoral Studies
Vice Head and Director
Gun Lidestav

Working
Committee

Deputy Head
Johan Fransson

Head of Department
Hans Petersson

Steering Committee Staff:

Pär Andersson
Jonas Bohlin
Pernilla Christensen
Magnus Ekström
Johan Fransson
Jonas Fridman
Gun Lidestav
Torgny Lind
Håkan Olsson
Hans Petersson
Dianne Staal Wästerlund
Pär Wilhelmsson
Sören Wulff
Karin Öhman

Administrative and
Economy Staff:

Head of Administration
Pär Andersson

Staff
Veronika Bredberg
Nanna Hjertkvist
Ylva Jonsson
Johanna Nilsson
Sofia Sjögren
Oskar Thurén

Figure:
Kenneth Olofsson, SLU
and Emma Sandström, SLU.

Facts and Figures

Revenues

| Revenues (1000 SEK)	Undergraduate and Master's Studies	Research and Doctoral Studies	Environmental Monitoring and Assessment	Support Function	Total
Government grants	3 263	20 282	39 588	0	63 133
External contracts	229	4 454	40 367	30	45 080
External grants	562	23 659	7 662	237	32 120
Other revenues	0	1 164	1 186	0	2 350
Total	4 054	49 559	88 803	267	142 683

- Government grants
- External contracts
- External grants
- Other revenues

2%
23%
44%
32%
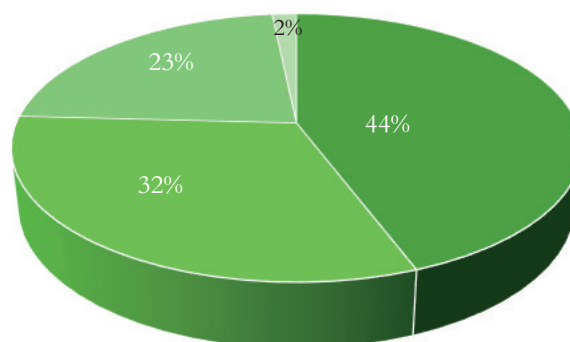
Costs

Costs (1000 SEK)	Undergraduate and Master's Studies	Research and Doctoral Studies	Environmental Monitoring and Assessment	Support Function	Total
Staff	2 381	26 839	52 473	8 104	89 797
Premises	375	2 533	2 411	647	5 966
Other operative expenses	83	5 724	15 534	2 082	23 423
Depreciation	37	479	490	30	1 036
Overheads	1 484	9 925	16 704	-10 596	17 517
Total	4 360	45 500	87 612	267	137 739

- Undergraduate and Master's Studies
- Research and Doctoral Studies
- Environmental Monitoring and Assessment

3%
33%
64%
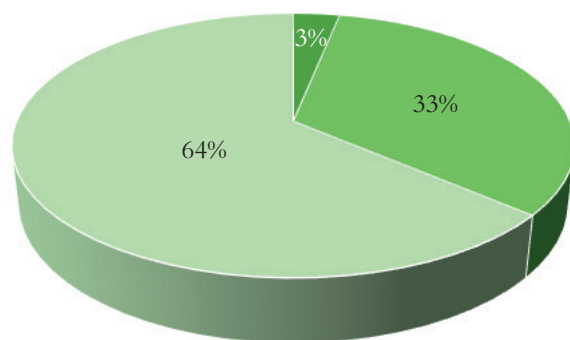
Personnel Categories

Staff	Number of Work–Years★
Professors	2.8
Senior lecturers	1.9
Associate senior lecturers	3.5
Researchers	22.1
Post doctoral researchers	1.6
Doctoral researchers	9.6
Other teachers	1.2
Administrative staff	6.2
Technical staff	35.3
Technical staff (field)	37.0
Total	121.3

★These figures show the number of work–years at the Department. It's not a true reflection of the number of employees.

External Contracts and Grants

Financier	Revenues (million SEK)
Swedish Environmental Protection Agency	31.5
Swedish Board of Agriculture	5.3
Swedish Forest Agency	3.9
Formas	3.6
The Foundation for Strategic Environmental Research	3.3
Vinnova	1.7
The Swedish Forest Society	1.4
EU	1.4
County Administrative Boards	1.2
Albania	1.2
Kempe Foundations	1.1
Bo Rydin Foundation for Scientific Research	1.1
The Royal Swedish Academy of Agriculture and Forestry	1.0
Ljungberg's Foundation	0.9
Saami Parliament	0.7
Forestry Research Institute of Sweden	0.6
USDA	0.6
Swedish Energy Agency	0.6
Boliden Mineral AB	0.6
Hildur and Sven Wingquist's Foundation	0.6
Food and Agriculture Organization of the United nations (FAO)	0.5
Swedish Research Council	0.5
Sveaskog	0.4
Södra	0.4
SCA	0.3
Swedish Forest-Owner Plans AB	0.3
IVL Swedish Environmental Research Institute	0.3
Brattås Foundation	0.2
Riksbanken Jubileumsfond	0.2
Stora Enso skog AB	0.2
Swedish National Space Board	0.2
Skogstekniska klustret	0.2
Holmen skog	0.1
Önnesjö Foundation	0.1
Billlerudkorsnäs Skog och Industri AB	0.1
Lantbrukarnas ekonomiska förening	0.1
Northern Research Institute (NORUT)	0.1
Kopparfors skogar	0.1
Carl Trygger's Foundation	0.1
The National Property Board of Sweden	0.1
The Church of Sweden	0.1
Others	10.3
Total	77.2

Vice Head and Director
Undergraduate and
Master's Studies
Jonas Bohlin

Undergraduate and Master's Studies

The department is a major contributor to SLU's MSc in Forestry degree programme (Jägmästarprogrammet). Our course offering amounts to about 40 ECTS credits at the undergraduate level and 45 ECTS credits at the Master's level. We offer courses in the following five subjects: Remote Sensing and geographic information technology (GIT), Forest Inventory, Forest Planning, Mathematical Statistics, and Organisation and Leadership. The individual courses for each subject are shown in the table below, divided into undergraduate and Master's level.

Master's Theses

Remote Sensing

Nilsson, August, 2020. Kartering av lämnade hänsyn-
sområden vid slutavverkning med hjälp av fjärran-
alys.
Supervisor: Jonas Bohlin

Kingstad, Victor, 2020. Evaluated density estimates
of young forest stands using high resolution 2D
imagery from UAV.
Supervisor: Jonas Bohlin

Forest Planning

Johansson, Emil, 2020. Användning av avverkning-
sentreprenörer vid avverkning av leveransvirke i
södra Sverige: en enkätundersökning bland Södra
skogsägarnas medlemmar.
Supervisor: Dianne Staal Wästerlund

Sundkvist, Paula, 2020. Historier om män- repre-
sentationer av maskuliniteter i tidningen skogen.
Supervisor: Dianne Staal Wästerlund

Tourda, Elli-Ristin, 2020. Renskötselanpassad
skoglig planering-strategier för bättre renbete.
Supervisor: Karin Öhman

Forest Inventory

Ramstedt, Cassandra, 2020. Investigating the pre-
requisites of a service guarantee for soil damages.
Supervisor: Torgny Lind

Sund, Maja Tomina, 2020. En effektutvärdering av
Skogsstyrelsens arbete med objektvis rådgivning
avseende hyggesfritt skogsbruk.
Supervisor: Gun Lidestav

Courses

Subject	Undergraduate Level (years 1-3) 40-80 students per course	Master's Level (years 4-5) 10-60 students per course
Remote Sensing and GIT, Forest Inventory and Mathematical Statistics	Basic GIT, 3 ECTS Introduction to Tree and Stand Measurement, 1 ECTS Measurement of Site Index, 1 ECTS Statistics and Forest Inventory, 15 ECTS Laser Scanning and Digital Photogrammetry in Forestry, 7.5 ECTS (given outside the Master's program)	Remote Sensing and Forest Inventory, 15 ECTS Advanced GIT, 7.5 ECTS
Forest Planning	Forest Management Planning, 4 ECTS Introduction to Forest Planning, 3.5 ECTS	Forest Sustainability Analysis, 7.5 ECTS
Organization and Leadership	Individual and Group Leadership, 0.3 ECTS	The Forestry from Organizational Theory Related Perspective, 15 ECTS
Landscape Studies	Gender Competence for the Forest Sector, 7.5 ECTS	

Doctoral Studies

Through course work, seminars and participation in focused research projects, the doctoral programme trains students in how to develop and address questions within the research subjects of Forest Management and Products, Technology and Mathematical Statistics. Within these subjects, students are supported by a team of experienced supervisors and a network of national and international expertise. The department additionally offers the unique experience of collaboration with environmental analysts and specialists involved in two major national monitoring programmes, i.e. the Swedish National Forest Inventory and the National Inventory of Landscapes in Sweden.

Vice Head and Director
Doctoral Studies
Gun Lidestav

During 2020 no dissertation took place at the Department.

Courses

Title	Credits	Participants	Responsible
Advanced R Programming	3.5 ECTS	12	Wenchao Zhou (UmU) Chandra Kiran (SEK) Magnus Ekström (SRH)
Basic R Programming	4 ECTS	13	Wenchao Zhou (UmU) Chandra Kiran (SEK) Magnus Ekström (SRH)
Gender and Forest: management, policy and governance	3.0 ECTS	1	Elias Andersson
Modelling of the forest landscape dynamics with help of an advanced decision support system	3.0 ECTS	13	Karin Öhman
Operations research and analytics in forestry	4.5 ECTS	19	Karin Öhman
Statistics I: Basic statistics	4.0 ECTS	6	Magnus Ekström
Statistics IV: Generalized linear models	4.0 ECTS	22	Svetlana Saarela

Forest Remote Sensing

Subject Area Manager
Håkan Olsson

Staff
Peder Axensten
Inka Bohlin
Jonas Bohlin
Mikael Egberth
Johan Fransson
Ann-Helen Granholm
Johan Holmgren
Mats Högström
Jonas Jonzen
Eva Lindberg
Mats Nilsson
Kenneth Olofsson
Henrik Persson
Emma Sandström
Jörgen Wallerman

Postdoctoral Researcher
Langning Huo

Doctoral Students
Arvid Axelsson
Raul de Paula Pires
Ivan Huuva
Nils Lindgren
André Wästlund

Within Forest Remote Sensing, we work with research, education and development of remote sensing of forests and other terrestrial vegetation. We also help with the processing of remote sensing data as part of SLU's environmental monitoring and assessment. We usually utilise data from optical, laser, or radar sensors. Traditionally, sensor platforms have included satellites, aircraft and drones. Increasingly, we also use sensors placed on the ground or in vehicles to depict trees from the side.

Publications

Scientific Articles

- Chi, J.; Nilsson, M.B.; Laudon, H.; Lindroth, A.; Wallerman, J.; Fransson, J.E.S.; Kljun, N.; Lundmark, T.; Ottosson Löfvenius, M. & Peichl, M. (2020). The net landscape carbon balance-integrating terrestrial and aquatic carbon fluxes in a managed boreal forest landscape in Sweden. Global Change Biology. 26(4):2353-2367.

- Forzieri ,G.; Pecchi, M.; Girardello, M.; Mauri, A.; Klaus, M.; Nikolov, C.; Rüetschi, M.; Gardiner, B.; Tomaštík, J.; Small, D.; Nistor, C.; Jonikavicius, D.; Spinoni, J.; Feyen, L.; Giannetti, F.; Comino, R.; Wolynski, A.; Pirotti, F.; Maistrelli, F.; Savulescu, I.; Wurpillot-Lucas, S.; Karlsson, S.; Zieba-Kulawik, K.; Strejczek-Jazwinska, P.; Mokroš, M.; Franz, S.; Krejci, L.; Haidu, I.; Nilsson, M.; Wezyk, P.; Catani, F.; Chen, Y.-Y.; Luyssaert, S.; Chirici, G.; Cescatti, A. & Beck, P. (2020). A spatially explicit database of wind disturbances in European forests over the period 2000-2018. Earth System Science Data. 12(1):257-276.

- Huo, L. & Lindberg, E. (2020). Individual tree detection using template matching of multiple rasters derived from multispectral airborne laser scanning data. International Journal of Remote Sensing. 41(24):9525-9544.

- Huuva, I.; Persson, H.J.; Soja, M.J.; Wallerman, J.; Ulander, L.M.H. & Fransson, J.E.S. (2020). Predictions of Biomass Change in a Hemi-Boreal Forest Based on Multi-Polarization L- and P-Band SAR Backscatter. Canadian Journal of Remote Sensing. 46(6):661-680.

- Klein, J.; Haverkamp, P.; Lindberg, E.; Griesser, M. & Eggers, S. (2020). Remotely sensed forest understory density and nest predator occurrence interact to predict suitable breeding habitat and the occurrence of a resident boreal bird species. Ecology and Evolution. 10(4):2238-2252.

- Klein, J.; Thor, G.; Low, M.; Sjögren, J.; Lindberg, E. & Eggers, S. (2020). What is good for birds is not always good for lichens: Interactions between forest structure and species richness in managed boreal forests. Forest Ecology and Management. 473.

- Kozii, N.; Haahti, K.; Torngren, P.; Chi, J.; Maher Hasselquist, E.; Laudon, H.; Launiainen, S.; Oren, R.; Peichl, M.; Wallerman, J. & Hasselquist, N. (2020). Partitioning growing season water balance within a forested boreal catchment using sap flux, eddy covariance, and a process-based model Hydrology and Earth System Sciences. 24(6):2999-3014.

- Leonardo, E.; Watt, M.; Pearse, G.; Dash, J. & Persson, H.J. (2020). Comparison of TanDEM-X InSAR data and high-density ALS for the prediction of forest inventory attributes in plantation forests with steep terrain. Remote Sensing of Environment. 246.

- Lidberg, W.; Nilsson, M. & Ågren, A. (2020). Using machine learning to generate high-resolution wet area maps for planning forest management: A study in a boreal forest landscape. AMBIO: A Journal of the Human Environment. 49(2):475-486.

- Persson, H.J.; Soja, M.J.; Fransson, J.E.S. & Ulander, L.M.H. (2020). National Forest Biomass Mapping Using the Two-Level Model. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing. 13:6391-6400.

- Persson, H.J. & Ståhl, G. (2020). Characterizing Uncertainty in forest remote sensing studies. Remote Sensing. 12(3).

- Stelmaszczuk-Górska, M.; Aguilar-Moreno, E.; Casteleyn, S.; Vandenboucke, D.; Miguel-Lago, M.; Dubois, C.; Lemmens, R.; Vancauwenberghe, G.; Olijslagers, M.; Lang, S.; Albrecht, F.; Belgiu, M.; Kriger, V.; Jagdhuber, T.; Fluhrer, A.; Soja, M.; Mouratidis, A.; Persson, H.J.; Colombo, R. & Masiello, G. (2020). Body of Knowledge for the Earth Observation and Geoinformation Sector – A Basis for Innovative Skills Development XLIII-B5-2020 pp:15-22. DOI:10.5194/isprs-archives-XLIII-B5-2020-15-2020

- Versluijs, M.; Hekkala, A-M.; Lindberg, E. & Länås, T. (2020). Comparing the effects of even-aged thinning and selective felling on boreal forest birds. Forest Ecology and Management. 475.

- Wallerman, J.; Nyström, K.; Nilsson, M.; Axensten, P.; Egberth, M.; Jonzen, J.; Sandström, E.; Fransson, J.E.S. & Olsson, H. Nation-wide mapping of tree growth using repeated airborne laser scanning. IGARSS 2020 - 2020 IEEE International Geoscience and Remote Sensing Symposium: proceedings.

- Zahriban Hesari, M.; Shataee, S.; Maghsoudi, Y.; Mohammadi, J.; Fransson, J.E.S. & Persson, H.J. (2020). Forest variable estimations using TanDEM-X data in hyrcanian forests. Canadian Journal of Remote Sensing. 46(2):166-176.

Reports

- Adelsköld, G.; Högström, M.; Lagerstedt, J. & Olsson, H. (2020). GET-tjänsten och infrastrukturen för distribution av geodata till universitet och högskolor. Institutionen för skoglig resurshushållning, Sveriges lantbruksuniversitet. Arbetsrapport/Sveriges lantbruksuniversitet, Institutionen för skoglig resurshushållning. 512.

- Forsberg, M.; Sabel, L.; Nässert Ericsson, M.; Paasch, J.; Steffen, H.; Olsson H.; Harrie, L.; Horemuz, M. & Ågren, J. (2020). Långsiktig kompetensförsörjning inom geodataområdet. Geodatarådet.

- Solberg, S.; Ulander, L.M.H.; Fransson, J.E.S.; Persson, H.J. & Wallerman, J. (2020). Technical assistance in the implementation of a C-band convoy mission demonstration campaign. In Final report, European Space Agency (ESA). 136 p.

- Willen, E.; Söderberg, J.; Lindgren, N.; Olsson, H. & Bohlin, J. 2020. Skogliga fjärranalysskattningar – utvärdering av fotogrammetrimetoder samt laser- och skördardata i gallringsskogar. Arbetsrapport 1067-2020, Skogforsk. 22 p.

Forest Inventory and Sampling

Forest Inventory and Sampling comprise general sampling theory, field-based forest and landscape inventory and, in relation to these activities, modelling and development of inventory systems that utilise multiple data sources. Forest inventory currently includes several aspects relevant to sustainable forestry. In addition to data on trees and stands, information on biodiversity and greenhouse gas balances is included. The subject area contributes knowledge to a large number of applications within applied forestry and environmental monitoring and assessment.

Publications

Scientific Articles

- Alberdi, I.; Bender, S.; Riedel, T.; Avitable, V.; Boriaud, O.; Bosela, M.; Camia, A.; Cañellas, I, Castro Rego, F.; Fischer, C.; Freudenschuß, A.; Fridman, J.; Gasparini, P.; Gschwantner, T.; Guerrero, S.; Kjartansson, B.; Kucera, M.; Lanz, A.; Marin, G.; Mubareka, S.; Notarangelo, M.; Nunes, L.; Pesty, B.; Pikula, T.; Redmond, J.; Rizzo, M.; Seben, V.; Snorrason, A.; Tomter, S. & Hernánde, L. (2020). Assessing forest availability for wood supply in Europe. Forest Policy and Economics. 111.

- Appiah Mensah, A.; Petersson, H.; Saarela, S.; Goude, M. & Holmström E. (2020). Using heterogeneity indices to adjust basal area – Leaf area index relationship in managed coniferous stands. Forest Ecology and Management. 458.

- Archambeau, J.; Ruiz-Benito, P.; Ratcliffe, S.; Fréjaville, T.; Changenet, A.; Munoz Castaneda J.; Lehtonen, A.; Dahlgren, J.; Zavala, M. & Benito Garzon, M. (2020). Similar patterns of background mortality across Europe are mostly driven by drought in European beech and a combination of drought and competition in Scots pine. Agricultural and Forest Meteorology. 280.

- Kunstler, G.; Guyennon, A.; Ratcliffe, S.; Rüger, N.; Ruiz-Benito, P.; Childs, D.Z.; Dahlgren, J.; Lehtonen, A.; Thuiller, W.; Wirth, C.; Zavala, M.A. & Salguero-Gomez, R. (2020). Demographic performance of European tree species at their hot and cold climatic edges. Journal of Ecology.

- Lawrence, A.; Deuffic, P.; Hujala, T.; Nichiforel, L.; Feliciano, D.; Jodlowski, K.; Lind, T.; Marchal, D.; Talkkari, A.; Vilkriste, L. & Wilhelmsson, E. (2020). Extension, advice and knowledge systems for private forestry: Understanding diversity and change across Europe. Land Use Policy. 94.

- Lehtonen, A.; Heikkinen, J.; Petersson, H.; Tupek, B.; Liski, E. & Mäkelä, A. (2020). Scots pine and Norway spruce foliage biomass in Finland and Sweden – testing traditional models vs. the pipe model theory. Canadian Journal of Forest Research. 50(2):146-154.

- Magnussen, S.; McRoberts, R.; Breidenbach, J.; Nord-Larsen, T.; Ståhl, G.; Fehrmann, L. & Schnell, S. (2020). Comparison of estimators of variance for forest inventories with systematic sampling-results from artificial populations. Forest Ecosystems. 7(1).

- Norden, J.; Harrison, P.; Mair, L.; Lundström A.; Kindvall, O. & Snäll, T. (2020). Occupancy versus colonization-extinction models for projecting population trends at different spatial scales. Ecology and Evolution. 10(6):3079-3089.

- Saarela, S.; Wästlund, A.; Holmström, E.; Appiah Mensah, A.; Holm, S.; Nilsson, M.; Fridman, J. & Ståhl, G. (2020). Mapping aboveground biomass and its prediction uncertainty using LiDAR and field data, accounting for tree-level allometric and LiDAR model errors. Forest Ecosystems. 7(1).

- Ståhl, G, Ekström, M, Dahlgren, J, Esseen, P-A, Grafström, A, Jonsson, B-G. (2020). Presence–absence sampling for estimating plant density using survey data with variable plot size. Methods in Ecology and Evolution. 11(4):580-590.

- Zhao, X. & Grafström, A. (2020). A sample coordination method to monitor totals of environmental variables. Environmetrics. 31(6).

Book Chapters

- Lundblad, M.; Petersson, H.; Karltun, E.; Wikberg, P-E.; & Bolinder, M. (2020). KP-LULUCF. In: National Inventory Report Sweden 2020 – Submitted under the United Nations Framework Convention on Climate Change. Swedish Environmental Protection Agency. pp. 472-498.

- Lundblad, M.; Petersson, H.; Karltun, E.; Wikberg, P-E.; & Bolinder, M. (2020). Land Use, Land-Use Change and Forestry (CRF sector 4). In: National Inventory Report Sweden 2020 – Submitted under the United Nations Framework Convention on Climate Change. Swedish Environmental Protection Agency. pp. 360-396.

Reports

- Espejo, A.; Federici, S.; Green, C.; Amuchastegui, N.; d'Annunzio, R.; Balzter, H.; Bholanath, P.; Brack, C.; Brewer, C.; Birigazzi, L.; Cabrera, E.; Carter, S.; Chand, N.; Donoghue, D.; Eggleston, S.; Fitzgerald, N.; Foody, G.; Galindo, G.; Goeking, S.; Grassi, G.; Held, A.; Herold, M.; Kleinn, C.; Kurz, W.; Lindquist, E.; McRoberts, R.; Mitchell, A.; Næsset, E.; Notman, E.; Quegan, S.; Rosenqvist, A.; Roxburgh, S.; Sannier, C.; Scott, C.; Ståhl, G.; Stehman, S.; Tupua, V.; Watt, P.; Wilson, S.; Woodcock, C. & Wulder, M. (2020). Integration of remote-sensing and ground-based observations for estimation of emissions and removals of greenhouse gases in forests: Methods and guidance from the Global Forest Observations Initiative, Edition 3.0. Rome, Italy: U.N. Food and Agriculture Organization. 300 p.

- Nilsson, P.; Fridman J. & Roberge, C. (2020). Skogsdata 2020. Aktuella uppgifter om de svenska skogarna från SLU Riksskogstaxeringen: Tema: Den döda veden. Institutionen för skoglig resurshushållning, Sveriges lantbruksuniversitet.

- Wulff, S. & Roberge, C. (2020). Inventering av granbarkborreangrepp i Götaland och Svealand 2020. Institutionen för skoglig resurshushållning, Sveriges lantbruksuniversitet. Arbetsrapport/Sveriges lantbruksuniversitet, Institutionen för skoglig resurshushållning. 521.

- Wulff, S & Roberge, C (2020). Inventering av almförekomst på Gotland 2020. Institutionen för skoglig resurshushållning, Sveriges lantbruksuniversitet. Arbetsrapport/Sveriges lantbruksuniversitet, Institutionen för skoglig resurshushållning. 520.

Subject Area Manager
Hans Petersson

Staff
Anton Grafström
Torgny Lind
Svetlana Saarela
Erik Wilhelmsson

Postdoctoral Research
Indu Indirabai

Doctoral Students
Alex Appiah Mensah
Wilmer Prentius
Xin Zhao

The publication list includes articles published within the Swedish National Forest Inventory.

Forest Planning

Subject Area Manager
Karin Öhman

Staff
Jeannette Eggers
Hampus Holmström
Mathias Kristoferqvist
Johanna Lundström
Tomas Lämås
Ylva Melin
Eva-Maria Nordström
Dianne Staal Wästerlund
Rickard Westerlund

Doctoral Students
Teresa López-Andújar
Fustel
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Many of the staff also
work in the Forest
Sustainability Analysis
program.

Forest Planning provides knowledge and analysis tools that can contribute to the sustainable use of forest resources with regard to economic, ecological and social values. Forest Planning deals with planning issues both from a forest-owner perspective and from a stakeholder or societal perspective. The research focused on forest owners primarily deals with quantitative methods used to translate owners' goals into long-term forest plans. The societal perspective is represented by providing long-term analysis on the national and regional levels, and on research on the forest landscape as a socioecological unit where various stakeholders converge and work together to influence the landscape's development.

Publications

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- Nichiforel. L.; Deuffic, P.; Jellesmark Thorsen, B.; Weiss, G.; Hujala. T.; Keary, K.; Lawrence, A.; Avdibegovici, M.; Dobšinská, Z.; Feliciano, D.; Górriz-Mifsud, E.; Hoogstra-Klein, M.; Jarský, V.; Jodłowski, K.; Luknine, D.; Pezdevšek Malovrh, S.; Nedeljkovic, J.; Nonic, D.; Krajter Ostoic, S.; Pukall, K.; Rondeux, J.; Samara, T.; Sarvašová, Z.; Scriban, R.; Šilingiene, R.; Sinko, M.; Stojanovska, M.; Stojanovski, V.; Stoyanov, T.; Teder, M.; Vennesland, B.; Wilhelmsson, E.; Wilkes-Allemann, J.; Živojinovic, I. & Bouriaud, L. (2020). Two decades of forest-related legislation changes in European countries analysed from a property rights perspective. Forest Policy and Economics. 115.

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Other publications

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Mathematical Statistics Applied to Forest Sciences

The application of mathematical and statistical methods in forest sciences is challenging due to the great number of variations present in nature, with complex dynamics that involve variations in both time and space. A wide range of mathematical-statistical methods is studied, developed and applied for collecting, analysing, interpreting and presenting empirical data. Such methods make it possible to draw conclusions based on empirical data and can be used for description, decision-making and prediction within the forest sciences.

Publications

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Landscape Studies

Through an interdisciplinary approach, Landscape Studies research focuses on the utilisation of landscapes, their multiple resources and their users. Through this research, we contribute to an increased understanding of the socioecological processes and how they change over time and in space. The connections between natural resource use, stewardship, ecosystem production and community development processes are of special interest. Our work builds upon capacities within environmental monitoring, forest impact assessment and work science including gender studies, policy, and rural development studies.

Publications

Scientific Articles

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- Pöyry, E.; Parvinen, P.; Mattila, O. & Holopainen, J. (2020). Engaged, but with what? Objects of engagement in technology-aided B2B customer interactions. Journal of Marketing Management. 36 (3-4):334-360.

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Environmental Monitoring and Assessment

SLU is unique among Swedish universities with its strong focus on Environmental Monitoring and Assessments (EMA). Within SLU, our department is unique as EMA is the dominating activity (roughly 60 per cent of the budget). For a large set of terrestrial variables, EMA is the long-term monitoring and assessment of stocks and changes in stocks. EMA includes data capture, analysis and reporting. Inventories in the field, remote sensing, or a combination of these two methods, are performed using area-based sampling designs adapted mainly to regional or larger scales. The idea is to carefully measure model variables on the sample units, meaning that most of the uncertainty should arise from the fact that only a sample and not the entire population is measured. The uncertainty of estimates can be controlled by an efficient design and a large sample, and it is possible to estimate the accuracy of the estimates. EMA is an efficient way to monitor "how much" without disturbing the population, while an experimental design focuses on explaining "why" in a well-defined manipulated area. Projections and scenarios about the future of terrestrial variables, often based on data from the monitoring programmes, are also considered part of EMA activities.

Swedish National Forest Inventory

SLU is the authority responsible for national official statistics in the area of forest status and change. Statistical products consist of area conditions, growing stock and tree biomass, annual growth, vegetation and habitat conditions, and forest damage. The Swedish National Forest Inventory (NFI) operates within the department to fulfil SLU's statistical responsibility. Through an annual field survey of sample plots spread across the entire country, data are collected for compilation and presentation of official statistics. The results are published annually in the publication Skogsdata, which can be downloaded in pdf format from our website. The statistics are also available in multiple formats, including APIs.

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National Inventory of Landscapes in Sweden

The National Inventory of Landscapes in Sweden (NILS), funded by the Swedish Environmental Protection Agency, has developed into a national umbrella programme for environmental monitoring under which several monitoring programmes are gathered. The main purpose of the inventories is to collect, analyse and present data on the status of landscapes and habitats in Sweden, and how these change over time. This includes providing data for e.g. follow-up of the Swedish national environmental objectives and the conservation status of habitats listed in the Habitats Directive for all habitats.

During 2019 and 2020, together with the Terrestrial Habitat Monitoring programme, NILS has developed a new sample design for national inventories. It is a multi-stage design with a combination of remote sensing and field inventories that makes it possible to inventory both common habitats as well as relatively uncommon habitats within the same general framework. During the 2020 field season, inventories of grasslands and deciduous forests were carried out as a large-scale test of the new sample design, with newly developed inventories in aerial images and field inventory. The inventory in the mountains continued in 2020, using the old NILS design for the last time.

Terrestrial Habitat Monitoring

The EU Habitats Directive can be seen as the foundation of the European Union's nature conservation policy. The directive aims to protect habitats and species of European community interest and it states that every member state must undertake surveillance of the conservation status of habitats and species. As a response, the Terrestrial Habitat Monitoring programme was initiated in 2006 to develop efficient methods for the monitoring and assessment of terrestrial habitats with a high conservation status, as well as for organising the necessary data collection, analysis and reporting.

Butterfly and Bumblebee Inventory

The Butterfly and Bumblebee Inventory (FHIN) is part of a nationwide long-term monitoring scheme of semi-natural grasslands commissioned by the Swedish Board of Agriculture. The objective is to detect and report changes in biodiversity quality. In a sample of nearly 700 meadows and pastures, we record species abundance and descriptive parameters by standardised transect walks.

Forest Sustainability Analysis

The Forest sustainability analysis (SHa) programme works with qualitative and quantitative analyses of the potential of forest ecosystems to provide various forms of ecosystem services in the long term. Through the programme, policy-makers, decision-makers and planners within a range of sectors in society, e.g. forestry, environment and energy, have access to expertise, analytical tools and decision support for issues related to forest development. The Heureka decision-support system is a central tool in most SHa analyses.

Field Staff

Every year, the department organises and implements extensive inventories of forests and landscapes in Sweden. To carry out this work, a number of field workers are employed.

Swedish National Forest Inventory

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