Department of
Forest Resource Management

Annual Report 2018

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Cover photo:
Åke Bruhn, SLU.
Publisher:
Johan Fransson, SLU.
Editor and Layout:
Emma Sandström, SLU.

Dear Reader,

It is now time to report on the Department's activities as the Earth has once again rotated one revolution in its elliptical orbit around the sun. It is a journey that takes about 365 days at a speed of more than 100,000 kilometers per hour! During this journey, a lot of exciting activities have happened at the Department in teaching, research and environmental monitoring and assessment that need to be highlighted. In comparison with previous years' annual reports, the format has changed slightly this year. The annual report has been slimmed down somewhat to instead report current research projects, etc., to a greater extent on our website. In this way, we hope that the information about the Department's activities can reach out to more readers.

This annual report is divided into the main fields of activities of the Department: Undergraduate, Master's and Doctoral studies, and research within five subject areas as well as five environmental monitoring and assessment programs. Also included in this report are the schematic view of the Department's organization, facts and figures, followed by a compilation of names of the field staff.

The most important event during the year must be considered the evaluation of Quality and Impact 2018 (KoN – Kvalitet och Nytta 2018), which aimed to highlight SLU's and the Departments' strengths as well as to suggest actions for improvement regarding research. The process started up in 2017, with the whole Department as a single Unit of Assessment (UoA), and the first part consisted of a self-evaluation divided into four sections: quality of research, societal impact of research, capacity for collaboration with society, and facts and figures about the UoA. This part was completed by the end of February. Secondly, a group chosen to represent the Department met a review panel for an interview at Ultuna on 30 May. Our UoA was to be evaluated within the panel of Forest Management consisting of eight experts within the research field. Finally, we received the expert panel's overall assessment report in June, where the Department consistently received top marks – 24 out of 27 credits! We were, thereby, ranked highest in Forest Management and also among the highest ranked UoAs at SLU as a whole. Thank you all for your excellent contributions throughout the years!!! The final version of the panel reports were made available to all at SLU in August. Analyses were carried out during autumn and presented at the SLU Board meeting in December. In 2019, the Department will continue with a follow-up of the KoN 2018 evaluation, which will be reported to Dean Göran Ståhl.

All of the achievements of the Department are, of course, based on a combination of individual and team efforts, contributions that all definitely deserve to be mentioned. This is unfortunately an impossible task. Nevertheless, I would like to highlight a few important events with respect to the staff during 2018:

- Karin Öhman was employed as Faculty Professor in Forest Planning
- Magnus Ekström was employed as Guest Professor in Mathematical Statistics Applied to Forest Sciences
- Elias Andersson was employed as Associate Senior Lecturer in Landscape Studies and Svetlana Saarela was employed as Associate Senior Lecturer in Forest Inventory and Sampling
- Osmo Mattila was employed as Postdoctoral Researcher
- Mattias Danielsson, Alex Appiah Mensah, Wilmer Prentius and Ulrika Roos were employed as Doctoral Students
- Andreas Press was employed as Research Engineer
- Åsa Ranlund and Cornelia Roberge were employed as Environmental Assessment Specialists
- Maria Spencer was employed as Economy Officer and Veronika Bredberg and Sofia Sjögren were employed as Human Resources Administrators
- Pär Andersson was employed as Head of Administration
- Henrik Hedenås was appointed as Program Manager for the NILS program
- Jonas Bohlin was appointed as Vice Head and Director of Undergraduate and Master's Studies
- Mona Forsman and Lars Sängstuvall defended their theses successfully
- Per Sandström received the Faculty award for external collaboration for his excellent collaboration with the surrounding society
- Elias Andersson and Gun Lidestav et al. were awarded with the FALF prize for "International publication of the year 2017", for an article that increases the understanding of men's discursive resistance to equality measures in working life
- Neil Cory, Åsa Eriksson, Karin Nordkvist, Heather Reese, Marcus Strandberg and Marianne Åkerholm left for other duties
- Anne-Maj Jonsson, Göran Kempe, Anders Lundström, Bo-Gunnar Olsson, Maud Tyboni and Carina Westerlund retired after a long, deserving and loyal service
- Johan Bergstedt, Tomas Lämås and Håkan Olsson were honored in a special celebration for employees that have served the government for 30 years

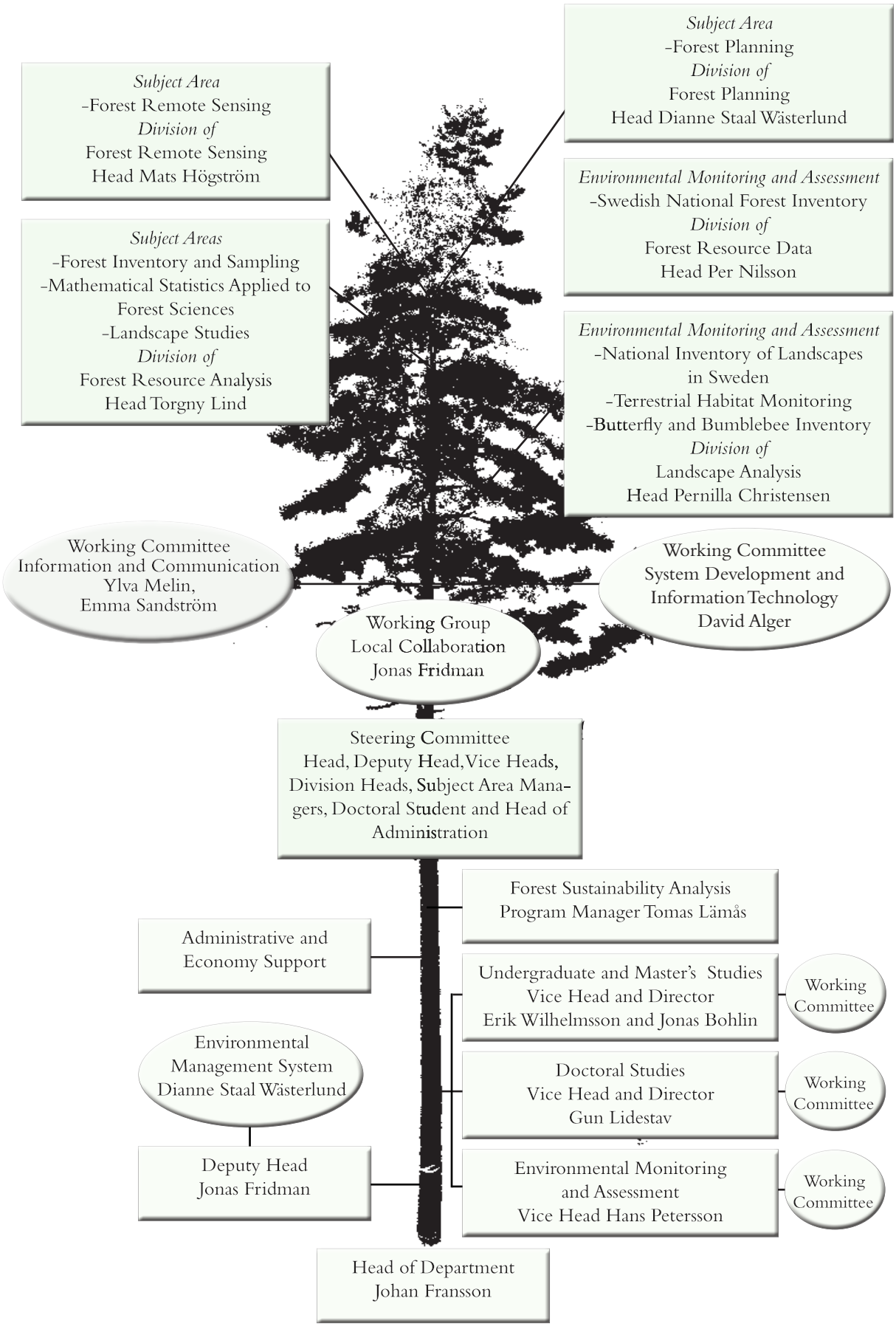
I hope you will enjoy reading this annual report and do not hesitate to contact us if you would like to find out more about the activities touched upon here. We would be more than pleased to share our knowledge and experiences with you!

Yours sincerely,

Johan Fransson
Head of Department

Organization

Schematic View of the Department



Steering Committee Staff:

Pär Andersson
Jonas Bohlin
Pernilla Christensen
Magnus Ekström
Ola Eriksson
Johan Fransson
Jonas Fridman
Mats Högström
Ivan Huuva
Gun Lidestav
Torgny Lind
Per Nilsson
Håkan Olsson
Hans Petersson
Arne Pommerening
Erik Wilhelmsson
Dianne Staal Wästerlund
Karin Öhman

Administrative and Economy Staff:

Head of Administration
Pär Andersson

Economy Officer
Anne-Maj Jonsson
Maria Spencer

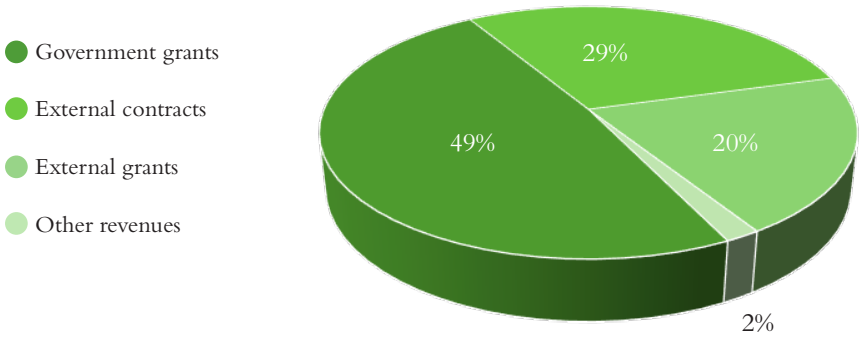
Administrators
Veronika Bredberg
Nanna Hjertkvist
Ylva Jonsson
Sofia Sjögren
Carina Westerlund

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	4 280	19 860	38 950	0	63 090
External contracts	111	3 557	34 426	80	38 174
External grants	140	19 192	6 830	212	26 374
Other revenues	0	1 174	1 171	0	2 345
Total	4 531	43 783	81 377	292	129 983



Costs

Costs (1000 SEK)	Undergraduate and Master's Studies	Research and Doctoral Studies	Environmental Monitoring and Assessment	Support Function	Total
Staff	2 255	24 558	48 097	8 289	83 199
Premises	450	2 273	2 238	984	5 945
Other operative expenses	79	3 526	14 826	1 950	20 381
Depreciation	105	281	130	24	540
Overheads	1 874	9 696	16 022	-10 951	16 641
Total	4 763	40 334	81 313	296	126 706

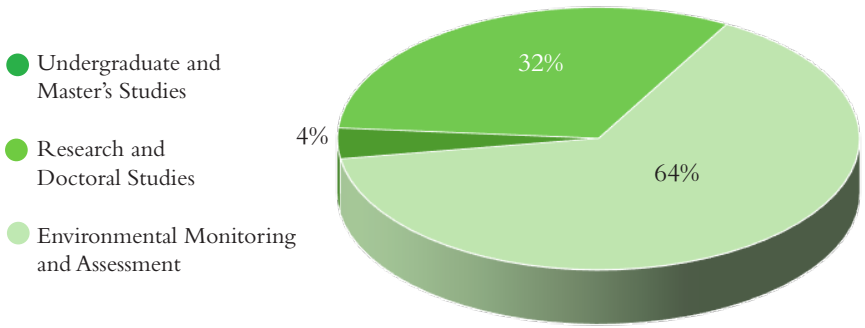


Table:
Pär Andersson, SLU.
Figure:
Emma Sandström, SLU.

External Contracts and Grants

Financier	Revenues (million SEK)
Swedish Environmental Protection Agency	28.9
Formas	5.9
Swedish Board of Agriculture	3.0
Swedish National Space Agency	2.3
EU	2.0
The Swedish Forest Society Foundation	1.4
Hildur and Sven Wingquist's Foundation	1.3
Albania	1.2
SCA	1.1
Forestry Research Institute of Sweden	0.9
The ÅForsk Foundation	0.8
Ljungberg's Foundation	0.7
Vinnova	0.7
Swedish Forest Agency	0.6
Saami Parliament	0.5
Brattås Foundation	0.4
Swedish Research Council	0.4
Sveaskog	0.3
Swedish National Land Survey	0.3
County Administrative Boards	0.2
Bo Rydin Foundation for Scientific Research	0.2
The Research Council of Norway	0.2
Swedish Forest-Owner Plans AB	0.2
Södra's Research Foundation	0.2
Statistics Sweden	0.2
Bergvik Skog	0.2
Kempe Foundations	0.1
Nordic Forest Research Co-Operation Committee	0.1
Holmen Skog	0.1
NIBIO (Norwegian Institute of Bioeconomy Research)	0.1
The Royal Swedish Academy of Agriculture and Forestry	0.1
Forest Science Research Foundation	0.1
The National Property Board of Sweden	0.1
The Church of Sweden	0.1
Others	10.0
Total	64.5

Personnel Categories

Staff	Number of Work-Years★
Professors	2.1
Senior lecturers	2.9
Associate senior lecturers	3.4
Researchers	20.6
Postdoctoral researchers	0.25
Doctoral students	6.8
Other teachers	1.4
Administrative staff	6.7
Technical staff	35.4
Technical staff (field)	36.9
Total	116.4

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

Table: Veronika Bredberg, Maria Spencer and Sofia Sjögren, SLU.

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

Undergraduate and Master's Studies

The Department is a major contributor to SLU's Master of Forestry Program (Jägmästarprogrammet). Our course selection amounts to about 40 ECTS credits at Undergraduate level and 45 ECTS credits at Master's level. The courses are given in the following five subjects: Remote Sensing and Geographic Information Technology (GIT), Forest Inventory, Forest Planning, Mathematical Statistics and Organization 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

Ellingsson, Anders, 2018. Field- and aerial image estimation of residual timber volumes in Medelpad after the storms of the 2010s. Supervisor: Jörgen Wallerman.

Jansson, Carl, 2018. Identification of uneven-aged stands using photogrammetry and airborne laser scanning. Supervisor: Eva Lindberg.

Larsson, Helene, 2018. Classification of ground lichen using Sentinel-2 and airborne laser data. Supervisor: Heather Reese.

Persson, Magnus, 2018. Tree species classification using multi-temporal Sentinel-2 data. Supervisors: Heather Reese and Eva Lindberg.

Wennerlund, Lisa, 2018. Evaluating the need of cleaning using 3D point clouds derived from high resolution images collected with a drone. Supervisors: Jonas Bohlin and Jonas Jonzén.

Forest Planning

Andreasson, Elin, 2018. Development and test of a supplier portfolio method for industrial wood supply. Supervisor: Ola Eriksson.

Brämsgården, Malin, 2018. Which forestry variables at the real estate level are most related to the wood yield value of forest properties in northern Sweden? Supervisor: Erik Wilhelmsson.

Bäckström, Hanna, 2018. The forest owners' ability to practice an alternative forestry in the county of Jämtland. Supervisor: Gun Lidestav.

Fjellgren Walkepää, Anja, 2018. The Swedish Forest Agency's handling of reindeer husbandry issues: An evaluation of knowledge, governance and regulations. Supervisor: Elias Andersson.

Mathematical Statistics

Svensson, Arvid, 2018. Classifying forest stands according to spatial species mingling. Supervisor: Arne Pommerening.

Organization and Leadership

Leifsdotter, Teresa, 2018. Leading by coaching: An evaluation of leadership training and its implementation within Stora Enso Skog and Stora Enso Bioenergy. Supervisor: Dianne Staal Wästerlund.

Others

Larsson, Jonas, 2018. Analysis of the total logistics cost for various raw material supply strategies to Tunadals sawmill. Supervisor: Dimitris Athanassiadis.

Löfdahl, Amanda, 2018. They were very pleased and ate everything we put in front of them: A study of the female forestry cook and her life in the forest camp. Supervisor: Lars Östlund.

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	Introduction to Forest Planning, 3.5 ECTS Forest Management Planning, 4 ECTS Forest Planning with PlanWise as Decision Support, 7.5 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

Text: Jonas Bohlin, SLU.
Table: Ylva Jonsson, SLU.

Doctoral Studies

Through course work, seminars and participation in research projects, the doctoral program trains students in how to develop and address questions within the research subjects of Forest Management and Products, Technology, Mathematical Statistics and Biology. Within these subjects the students are supported by a team of experienced supervisors and network of national and international expertise. The Department additionally offers the unique experience of collaborating with researchers actively involved in two major national monitoring programes., i.e. the Swedish National Forest Inventory and the National Inventory of Landscapes in Sweden.

Vice Head and Director
Doctoral Studies
Gun Lidestav

Doctorate - Forest Remote Sensing

Mona Forsman
Tree stem diameter estimation from terrestrial point clouds

Dissertation: October
Supervisor: Associate Professor Johan Holmgren
Assistant supervisors: Associate Professor Heather Reese, Associate Professor Kenneth Olofsson and Senior Lecturer (Associate Professor) Niclas Börlin

Doctorate - Forest Planning

Lars Sängstuvall
Improved harvesting technology for thinning of small diameter stands

Dissertation: December
Supervisor: Associate Professor Tomas Lämås
Assistant supervisors: Senior Adviser Ola Eriksson and Professor Tomas Nordfjell

Courses

Title	Credits	Participants	Responsible
Introduction to Survey Sampling	3.0 ECTS	19	Svetlana Saarela
Modelling of the Forest Landscape Dynamics With Help of an Advanced Decision Support System	3.0 ECTS	10	Karin Öhman
Remote Sensing and Forest Inventory	7.5 ECTS	1	Jonas Bohlin

Text: Gun Lidestav, SLU.
Table: Ylva Jonsson, SLU.
Photo: Julio Gonzalez, SLU.

Forest Remote Sensing

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 within the framework 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 small, unmanned aircraft vehicles (so-called UAVs or drones). Increasingly, we also use sensors placed on the ground or in vehicles, which depict trees from the side.

Subject Area Manager
Håkan Olsson

Staff
Peder Axensten
Jonas Bohlin
Mikael Egberth
Johan Fransson
Ann-Helen Granholm
Johan Holmgren
Mats Högström
Jonas Jonzén
Eva Lindberg
Mats Nilsson
Karin Nordkvist
Mattias Nyström
Kenneth Olofsson
Henrik Persson
Heather Reese
Emma Sandström
Jörgen Wallerman

Postdoctoral Researcher
Inka Bohlin

Doctoral Students
Arvid Axelsson
Mona Forsman
Ivan Huuva
Nils Lindgren
André Wästlund

Guest Researchers
Langning Huo
Mozhgan Zahribanhesari

Publications

Scientific Articles

- Askne, J.I.H., Persson, H.J. and Ulander, L.M.H. 2018. Biomass growth from multi-temporal TanDEM-X interferometric Synthetic Aperture Radar observations of a boreal forest site. Remote Sensing, vol. 10, no. 4.
- Axelsson, A., Lindberg, E. and Olsson, H. 2018. Exploring multispectral ALS data for tree species classification. Remote Sensing, vol. 10, no. 2.
- Ehlers, S., Saarela, S., Lindgren, N., Lindberg, E., Nyström, M., Persson, H., Olsson, H. and Ståhl, G. 2018. Assessing error correlations in remote sensing-based estimates of forest attributes for improved composite estimation. Remote Sensing, vol. 10, no. 5.
- Forsman, M., Börlin, N., Olofsson, K., Reese, H. and Holmgren, J. 2018. Bias of cylinder diameter estimation from ground-based laser scanners with different beam widths: A simulation study. ISPRS Journal of Photogrammetry and Remote Sensing, vol. 135, pp. 84-92.
- Kangas, A., Astrup, R., Breidenbach, J., Fridman, J., Gobakken, T., Korhonen, K.T., Maltamo, M., Nilsson, M., Nord-Larsen, T., Naesset, E. and Olsson, H. 2018. Remote sensing and forest inventories in Nordic countries - roadmap for the future. Scandinavian Journal of Forest Research, vol. 33, no. 4, pp. 397-412.
- Liang, X., Hyyppä, J., Kaartinen, H., Lehtomäki, M., Pyörälä, J., Pfeifer, N., Holopainen, M., Brolly, G., Francesco, P., Hackenberg, J., Huang, H., Jo, H.-W., Katoh, M., Liu, L., Mokroš, M., Morel, J., Olofsson, K., Poveda-Lopez, J., Trochta, J., Wang, D., Wang, J., Xi, Z., Yang, B., Zheng, G., Kankare, V., Luoma, V., Yu, X., Chen, L., Vastaranta, M., Saarinen, N. and Wang, Y. 2018. International benchmarking of terrestrial laser scanning approaches for forest inventories. ISPRS Journal of Photogrammetry and Remote Sensing, vol. 144, pp. 137-179.
- Vastaranta, M., Yu, X., Luoma, V., Karjalainen, M., Saarinen, N., Wulder, M.A., White, J.C., Persson, H.J., Hollaus, M., Yrttimaa, T., Holopainen M. and Hyyppä J. 2018. Aboveground forest biomass derived using multiple dates of WorldView-2 stereo-imagery: Quantifying the improvement in estimation accuracy. International Journal of Remote Sensing, vol. 39, no. 23, pp. 8766-8783.
- Mononen, L., Auvinen, A.-P., Packalen, P., Virkkala, R., Valbuena, R., Bohlin, I., Valkama, J. and Vihervaara, P. 2018. Usability of citizen science observations together with airborne laser scanning data in determining the habitat preferences of forest birds. Forest Ecology and Management, vol. 430, pp. 498-508.
- Olofsson, K. and Olsson, H. 2018. Estimating tree stem density and diameter distribution in single-scan terrestrial laser measurements of field plots: A simulation study. Scandinavian Journal of Forest Research, vol. 33, no. 4, pp. 365-377.
- Pearse, G.D., Dash, J.P., Persson, H.J. and Watt, M.S. 2018. Comparison of high-density LiDAR and satellite photogrammetry for forest inventory. ISPRS Journal of Photogrammetry and Remote Sensing, vol. 142, pp. 257-267.
- Persson, M., Lindberg, E. and Reese, H. 2018. Tree species classification with multi-temporal sentinel-2 data. Remote Sensing, vol. 10, no. 11.
- Soja, M.J., Persson, H.J. and Ulander, L.M.H. 2018. Modeling and detection of deforestation and forest growth in multitemporal TanDEM-X data. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, vol. 11, no. 10, pp. 3548-3563.
- Wästlund, A., Holmgren, J., Lindberg, E. and Olsson, H. 2018. Forest variable estimation using a high altitude single photon lidar system. Remote Sensing, vol. 10, no. 9.

Doctoral Thesis

- Forsman, M. 2018. Tree stem diameter estimation from terrestrial point clouds. Department of Forest Resource Management, SLU, no. 2018:54.

Report

- Olsson, H., Lindberg, E., Wallerman, J. and Holmgren, J. 2018. Fjärranalysforskning på Remningstorp – exempel från SLU. Arbetsrapport, Institutionen för skoglig resurshushållning, Sveriges lantbruksuniversitet, vol. 479.

Text:
Heather Reese, SLU.

Forest Inventory and Sampling

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

Publications

Scientific Articles

- Cienciala, E., Altman, J., Doležal, J., Kopáček, J., Štěpánek, P., Ståhl, G. and Tumajer, J. 2018. Increased spruce tree growth in Central Europe since 1960s. Science of the Total Environment, vol. 619-620, pp. 1637-1647.
- Ekström, M., Esseen, P.A., Westerlund, B., Grafström, A., Jonsson, B.G. and Ståhl, G. 2018. Logistic regression for clustered data from environmental monitoring programs. Ecological Informatics, vol. 43, pp. 165-173.
- Grafström, A. and Matei, A. 2018. Spatially balanced sampling of continuous populations. Scandinavian Journal of Statistics, vol. 45, no. 3, pp. 792-805.
- Grafström, A. and Matei, A. 2018. Coordination of spatially balanced samples. Survey Methodology, vol. 44, no. 2, pp. 215-238.
- Hou, Z.Y., McRoberts, R.E., Ståhl, G., Packalen, P., Greenberg, J.A. and Xu, Q. 2018. How much can natural resource inventory benefit from finer resolution auxiliary data? Remote Sensing of Environment, vol. 209, pp. 31-40.
- Jaramillo, F., Cory, N., Arheimer, B., Laudon, H., van der Velde, Y., Hasper, T.B., Teutschbein, C. and Uddling, J. 2018. Dominant effect of increasing forest biomass on evapotranspiration: Interpretations of movement in Budyko space. Hydrology and Earth System Sciences, vol. 22, no. 1, pp. 567-580.
- Lynch, T.B., Ståhl, G. and Gove, J.H. 2018. Use of stereology in forest inventories - A brief history and prospects for the future. Forests, vol. 9, no. 5.
- Majasalmi, T., Eisner, S., Astrup, R., Fridman, J. and Bright, R.M. 2018. An enhanced forest classification scheme for modeling vegetation-climate interactions based on national forest inventory data. Biogeosciences, vol. 15, no. 2, pp. 399-412.
- McRoberts, R.E., Naesset, E., Gobakken, T., Chirici, G., Condés, S., Hou, Z.Y., Saarela, S., Chen, Q., Ståhl, G. and Walters, B.F. 2018. Assessing components of the model-based mean square error estimator for remote sensing assisted forest applications. Canadian Journal of Forest Research, vol. 48, no. 6, pp. 642-649.
- Nussbaumer, A., Waldner, P., Apuhtin, V., Aytar, F., Benham, S., Bussotti, F., Eichhorn, J., Eickenscheidt, N., Fabianek, P., Falkenried, L., Leca, S., Lindgren, M., Serrano, M.J.M., Neagu, S., Nevalainen, S., Pajtik, J., Potoĉić, N., Rautio, P., Sioen, G., Stakénas, V., Tasdemir, C., Thomsen, I.M., Timmermann, V., Ukonmaanaho, L., Verstraeten, A., Wulff, S. and Gessler, A. 2018. Impact of weather cues and resource dynamics on mast occurrence in the main forest tree species in Europe. Forest Ecology and Management, vol. 429, pp. 336-350.
- Puliti, S., Saarela, S., Gobakken, T., Ståhl, G. and Naesset, E. 2018. Combining UAV and Sentinel-2 auxiliary data for forest growing stock volume estimation through hierarchical model-based inference. Remote Sensing of Environment, vol. 204, pp. 485-497.
- Saarela, S., Holm, S., Healey, S.P., Andersen, H.E., Petersson, H., Prentius, W., Patterson, P.L., Naesset, E., Gregoire, T.G. and Ståhl, G. 2018. Generalized hierarchical model-based estimation for aboveground biomass assessment using GEDI and Landsat data. Remote Sensing, vol. 10, no. 11.
- Schelhaas, M.-J., Hengeveld, G.M., Heidema, N., Thürig, E., Rohner, B., Vacchiano, G., Vayreda, J., Redmond, J., Socha, J., Fridman, J., Tomter, S., Polley, H., Barreiro, S. and Nabuurs, G. -J.2018. Species-specific, pan-European diameter increment models based on data of 2.3 million trees. Forest Ecosystems, vol. 5.
- Schelhaas, M.-J., Fridman, J., Hengeveld, G.M., Henttonen, H.M., Lehtonen, A., Kies, U., Krajnc, N., Lerink, B., Dhubhain, A.N., Polley, H., Pugh, T.A.M., Redmond, J.J., Rohner, B., Temperli, C., Vayreda, J. and Nabuurs, G.-J. 2018. Actual European forest management by region, tree species and owner based on 714,000 re-measured trees in national forest inventories. PLoS ONE, vol. 13, no. 11.
- Valinger, E., Berg, S. and Lind, T. 2018. Reindeer husbandry in a mountain Sami village in boreal Sweden: The social and economic effect of introducing GPS collars and adaptive forest management. Agroforestry Systems, vol. 92, no. 4, pp. 933-943.
- van der Plas, F., Ratcliffe, S., Ruiz-Benito, P., Scherer-Lorenzen, M., Verheyen, K., Wirth, C., Zavala, M.A., Ampoorter, E., Baeten, L., Barbaro, L., Bastias, C.C., Bauhus, J., Benavides, R., Benneter, A., Bonal, D., Bouriaud, O., Bruelheide, H., Bussotti, F., Carnol, M., Castagneyrol, B., Charbonnier, Y., Cornelissen, J.H.C., Dahlgren, J., et al. 2018. Continental mapping of forest ecosystem functions reveals a high but unrealised potential for forest multifunctionality. Ecology Letters, vol. 21, no. 1, pp. 31-42.

Reports

- Fridman, J. and Wulff, S. 2018. Skogsdata 2018. Aktuella uppgifter om de svenska skogarna från Riksskogstaxeringen. Tema: Riksskogstaxeringens kvalitetssäkringsarbete.
- Gulsrud, N.M., Nielsen, A.B., Bastrup-Birk, A., Olafsson, A.S., Lier, M., Fischer, C., Zalkauskas, R., Hedblom, M., Sievanen, T., Nordh, H., Dahlgren, J., Kulbokas, G., Davies, C., Polley, H., Brandli, U.-B., Kriher, F., Johannsen, V. K., Nord-Larsen, T., Haakana, H., Ihalainen, A., Korhonen, K., Straigte, L., Tomter, S., Sing, L., Edwards, D. and Ross, D. 2018. Urban forests in a European perspective: What can the National Forest Inventory tell us. Summary of workshop results, Department of Geosciences and Natural Resource Management, University of Copenhagen, 16 pp.

Subject Area Manager
Hans Petersson

Staff
Anna-Lena Axelsson
Henrik Feychting
Anton Grafström
Torgny Lind
Svetlana Saarela

Doctoral Students
Alex Appiah Mensah
Wilmer Prentius
Xin Zhao

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

Text:
Hans Petersson, SLU.

Forest Planning

Subject Area Managers
Ola Eriksson and
Karin Öhman

Staff
Hampus Holmström
Johanna Lundström
Tomas Lämås
Ylva Melin
Eva-Maria Nordström
Dianne Staal Wästerlund
Erik Wilhelmsson

Doctoral Student
Pär Wilhelmsson

Guest Researchers
Inci Çaglayan

Many of the staff also work in the Forest Sustainability Analysis program.

Forest planning shall provide expertise and analysis tools that can contribute to sustainable forestry for forest owners and other users, taking into account the economy, nature values and social values. Forest planning deals with planning issues from both a business perspective and from a stakeholder or community perspective. The focus of research on the forest enterprise deals basically with methods to translate owners' goals into a forest plan. The community perspective is above all represented by research on the forest landscape as a socio-ecological unit, where various stakeholders converge and work together to influence the landscape's development.

Publications

Scientific Articles

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- Lundström, J., Öhman, K. and Laudon, H. 2018. Comparing buffer zone alternatives in forest planning using a decision support system. Scandinavian Journal of Forest Research, vol. 33, no. 5, pp. 493-501.
- Mair, L., Jönsson, M., Räty, M., Bärring, L., Strandberg, G., Lämås, T. and Snäll, T. 2018. Land use changes could modify future negative effects of climate change on old-growth forest indicator species. Diversity and Distributions, vol. 24, no. 10, pp. 1416-1425.
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- Staal Wästerlund, D. 2018. Factors explaining the interest of adult offspring in succeeding their parents as forest owners. Forests, vol. 9, no. 11.

Doctoral Thesis

- Sängstuvall, L. 2018. Improved harvesting technology for thinning of small diameter stands. Department of Forest Resource Management, SLU, no. 2018:66.

Report

- Aggestam, F., Ambrušová, L., Chauvin, C., Dobšinská, Z., Sarvašová, Z., Wilhelmsson, E. and Wolfslehner, B. 2018. Policy frameworks to secure the multifunctionality of mountain forests. ARANGE project.

Text:
Ola Eriksson, SLU.

Mathematical Statistics Applied to Forest Sciences

This subject area is concerned with research on mathematical and statistical methods for effectively describing and modelling characteristics and traits related to organisms and life processes that are part of forest ecosystems and forest landscapes. We carry out quantitative studies of forest management, forest ecology and of other aspects of forest sciences with a focus on forest biometrics. For these purposes, we perform statistical and mathematical analyses and modelling of temporal, spatial and spatio-temporal data and develop new methods.

Publications

Scientific Articles

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The publication list includes articles published within the NILS, THUF and FHIN programs.

The subject area Landscape studies conducts research on the various use of landscapes and its multiple resources aiming at an increased understanding of how socio-ecological processes, utilisation of natural resources and their organisation changes over time and at different spatial levels. Connections between natural resource use, stewardship, ecosystem production and community development processes, are of special interest. Our work builds upon competence in environmental monitoring, forestry consequence analysis, work science and rural development studies, complemented with studies of formal and informal institutions.

Publications

Scientific Articles

- Andersson, E., Johansson, M., Lidestav, G. and Lindberg, M. 2018. Constituting gender and gender equality through policy: The political of gender mainstreaming in the Swedish forest industry. Equality, Diversity and Inclusion, vol. 37, no. 8, pp. 763-779.
- Andersson, E. and Keskitalo, E.C.H. 2018. Adaptation to climate change? Why business-as-usual remains the logical choice in Swedish forestry. Global Environmental Change, vol. 48, pp. 76-85.
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- Andersson, J., Gómez, E.D., Michon, S. and Roberge, J.-M. 2018. Tree cavity densities and characteristics in managed and unmanaged Swedish boreal forest. Scandinavian Journal of Forest Research Journal, vol. 33, no. 3, pp. 233-244.
- Andersson-Sköld, Y., Klingberg, J., Gunnarsson, B., Cullinane, K., Gustafsson, I., Hedblom, M., Knez, I., Lindberg, F., Ode Sang, Å., Pleijel, H., Thorsson, P. and Thorsson, S. 2018. A framework for assessing urban greenery's effects and valuing its ecosystem services. Journal of Environmental Management, vol. 205, pp. 274-285.
- Bjärstig, T., Thellbro, C., Stjernström, O., Svensson, J., Sandström, C., Sandström, P. and Zachrisson, A. 2018. Between protocol and reality - Swedish municipal comprehensive planning. European Planning Studies, vol. 26, no. 1, pp. 35-54.
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- La Sorte, F.A., Lepczyk, C.A., Aronson, M.F.J., Goddard, M.A., Hedblom, M., Katti, M., MacGregor-Fors, I., Mörtberg, U., Nilon, C.H., Warren, P.S., Williams, N.S.G. and Yang, J. 2018. The phylogenetic and functional diversity of regional breeding bird assemblages is reduced and constricted through urbanization. Diversity and Distributions, vol. 24, no. 7, pp. 928-938.
- Maesano, M., Ottaviano, M., Lidestav, G., Lasserre, B., Matteucci, G., Mugnozza, G.S. and Marchetti, M. 2018. Forest certification map of Europe. iForest - Biogeosciences and Forestry, vol. 11, no. 4, pp. 526-533.
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Report

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- Glimskär, A., Berg, Å., Zmihorski, M., Cronvall, E. and Eriksson, Å. 2018. Kvalitetsförändringar i ängs- och betesmarker med och utan miljöersättning. Utvärderingsrapport 2017:4, Jordbruksverket.
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Text: Gun Lidestav, SLU.

Environmental Monitoring and Assessment

SLU is unique among Swedish universities with its strong focus on environmental monitoring and assessments (Foma). Within SLU, the Department is also quite unique with Foma as the dominating activity (roughly 60% of the budget). For a large set of terrestrial variables, Foma is the long-term monitoring and assessment of stocks and changes in stocks. Foma includes data capture, analysis and reporting. The inventories in the field, using remote sensing or by combining these two, 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, and thus 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. Foma 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 programs, are also regarded as Foma.

Vice Head
Envrionmental Monitoring and Assessment
Hans Petersson

Text:
Hans Petersson, SLU.

Swedish National Forest Inventory

SLU is the responsible authority for the official statistical area Forest Status and Change within the field of Agriculture, Forestry and Fisheries. 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, where the statistics also can be downloaded in multiple formats including APIs.

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National Inventory of Landscapes in Sweden

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Many of the staff also work in the THUF and FHIN programs.

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Henrik Hedenås, SLU.
Photo: Jenny Svennås-Gillner, SLU.

The National Inventory of Landscapes in Sweden (NILS), funded by the Swedish Environmental Protection Agency, aims to monitor the status and trends in biodiversity and landscape structures in all types of terrestrial environments. Field data are collected within 639 squares (1 km × 1 km each) using circular sample plots and line-intersect sampling.

Terrestrial Habitat Monitoring

Program Manager
Hans Gardfjell

Text: Åsa Hagner, SLU.

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

Butterfly and Bumblebee Inventory

Program Manager
Erik Cronvall

Text: Eric Cronvall, SLU.

The Butterfly and Bumblebee Inventory (FHIN) was established in 2006 as part of an assignment from the Swedish Board of Agriculture. The objective is to detect and report changes in the quality of meadows and pastures in Sweden. A sample of nearly 700 meadows and pastures in the vicinity of the sample plots used in NILS is visited over periods of 5 years.

Forest Sustainability Analysis

Program Manager
Tomas Lämås

Many of the staff in Forest Planning also work in the Forest Sustainability Analysis program.

Text: Tomas Lämås and Johanna Lundström, SLU.

The program Forest Sustainability Analysis (SHa) 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 program, policy-makers, decision-makers and planners within a range of sectors in society, e.g. forestry, environment and energy, shall have access to expertise, analytical tools and support for decisions on issues related to forest development.

Field Staff

Every year the Department organizes 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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