**Course leaders: Paul Kardol and Maria Myrstener**

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| **Module 1: Introduction to Forest Ecosystem Ecology + Writing + R** | | | | | |
| **Date** | **Time** | **What** | **Topic** | **Who** | **Room** |
| Tue 1 Nov | 09:00-09:45  10:00-10:45 | Introduction  Lecture | Course introduction  Introduction to boreal forest ecosystems | PK + MM | P-O Bäckströms sal |
| 10:45-12:00  13:00-16.00 | Group projects  Group projects | Introduction to group projects + dividing students into groups  Project group meeting / reading | KV + MK + CS + JLG + MM  (PK + MM) | P-O Bäckströms sal  Decide with supervisor |
| Wed 2 Nov | 09.00-12:00 | Group projects | Group meeting with supervisors: experimental design, etc. |  | Decide with supervisor |
| 13:00-15:00 | Lecture | How to write papers that are precise and concise, and easy to grasp | PK | Bokskogen |
| Thu 3 Nov | All day | Group projects | Decide with project leader | | |
| Fri 4 Nov | 09:00-12:00  13:00-16:00 | Exercise  Exercise | Introduction to R: data manipulation  R data manipulation | LK +RBH | Datorsal 1A-B  Datorsal 3A |
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| Mon 7 Nov | 09:00-12:00  13:00-16:00 | Exercise  Own work | R data plotting  R practice  (Exercise deadline for Extra task 5 23:59) | LK + RBH | P-O bäckström+ Datorsal 1A-B |

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| **Module 2: Carbon** | | | | | |
| **Date** | **Time** | **What** | **Topic** | **Who** | **Room** |
| Tue 8 Nov | 09:00-10.00  10.00-11:00  11.00-12.00 | Lecture  Lecture  Lecture | Principles of C-stores and C-fluxes, the roles of production, consumption and physical transport for the fluxes.  Methods to estimate carbon stores and fluxes  Carbon allocation, carbon budgets of  managed forests | MP  AK  HL | P-O Bäckströms sal |
|  | Afternoon | Reading |  |  |  |
| Wed 9 Nov | 09:00-10:00  10:00-12:00 | Lecture  Exercise | Carbon fixation and individual plant growth, water-use efficiency, controls  Demonstration: measurements of C-fixation and water use efficiency  Response curve analysis | NH  NH | P-O Bäckströms sal |
| 13:00-16:00 | Reading |  |  |  |
| Thu 10 Nov | 09:00-10:00  10:00-11:00 | Lecture  Lecture | Carbon loss from the ecosystem to the atmosphere  Degradation of organic matter and soil organic matter accumulation in the boreal landscape | JR  JR | P-O Bäckströms sal |
|  | 13:00-16:00 | Exercise | Biosphere – Atmosphere CO2 exchange | JR, AK (MP) | Datorsal 1A-B + P-O Bäckströms sal |
| Fri 11 Nov | 09:00-12:00 | Exercise | Biosphere – Atmosphere CO2 exchange | JR, AK (MP) | Datorsal 1A-B |
| 13:00-16:00 | Writing | Summary report writing from exercises | JR, AK (MP) | Datorsal 1A-B |

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| **Module 3: Water** | | | | | |
| **Date** | **Time** | **What** | **Topic** | **Who** | **Room** |
| Mon 14 Nov | All day | Group projects |  | | |
| Tue 15 Nov | 09:00-12:00  13.00-16.00 | Lecture  Reading | Water cycle in boreal forests  (including assignment instructions)  Reading for water week | LK | P-O Bäckströms sal |
| Wed 16 Nov | 09:00-12:00  13:00-16:00 | Lecture  Assignment  (individual) | Eco-hydrology of individual plants  Human influences on water - modelling | NK | Aspen |
| Thu 17 Nov | 09:00-11:00  13.00-16.00 | Interactive lecture  Optional computer lab | Human influences on the water cycle  Plotting in R | LK+NK  LK+MM | Aspen  Datorsal 1A-B |
| Fri 18 Nov | 09:00-12:00 | Assignment (individual) | Hydrological modelling assignment (deadline Friday 23:59) |  | Datorsal 1A-B  Datorsal 3A |

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| **Module 4: Cycling of nutrients, hydrogen ions and element biogeochemistry** | | | | | |
| **Date** | **Time** | **What** | **Topic** | **Who** | **Room** |
| Mon 21 Nov | 09.00-12.00 | Group projects |  | | |
| 13.00-16.00 | Reading | Reading for the biochemistry week |  |  |
| Tue 22 Nov | 09:00-10:45  11:00-12:00  13.00-16.00 | Lecture  Lecture  Own work | Soil components, mineral weathering and acid-base reactions  processes and cycling at different temporal and spatial scales  Nitrogen cycling and plant uptake  Reading | US  TN | Aspen  Aspen |
| Wed 23 Nov | 09:00-11:00  13:00-16:00 | Lecture  Exercise | Hydrogen ion budgets – theory  Individual work: Hydrogen ion budgets | US | P-O Bäckströms sal  Datorsal 1A-B  Datorsal 3A |
| Thu 24 Nov | 09:00-12:00  13:00-15:00 | Exercise  Lecture | Individual work: Hydrogen ion budgets  Microbial-soil redox processes in a landscape perspective | MÖ | Datorsal 1A-B  Datorsal 3A  Bokskogen |
| Fri 25 Nov | 09:00-12:00 | Exercise | Individual work: Hydrogen ion budgets |  | Datorsal 1A-B  Datorsal 3A |
|  | 13:00-16:00 | Exercise | Individual work and symposium preparation in groups: Hydrogen ion budgets |  | Datorsal 1A-B  Datorsal 3A |
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| Mon 28 Nov | 09:00-12:00    13:00-16:00 | Exercise  Seminar | Symposium preparation in groups: Hydrogen ion budgets  Oral group presentations: Hydrogen ion budgets  Deadline reports: 23:59 | US + MÖ | Bokskogen  Bokskogen |

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| **Module 5: Microbes, soil fauna, and soil food webs** | | | | | |
| **Date** | **Time** | **What** | **Topic** | **Who** | **Where** |
| Tue 29 Nov | 09:00-09:10  09:10-11:00 | Lecture | Introduction to individual assignment  Forest microbial ecology: An introduction | PK  KC | P-O Bäckströms sal |
| 13.00-16.00 | Group projects |  |  |  |
| Wed 30 Nov | 09:00-11:00  12:00- 16:00 | Lecture  Reading + work on individual assignment | Mycorrhizal symbiosis | NH | Bokskogen |
| Thu 1 Dec | 09:00-11:00  13:00-15:00 | Lecture  Lab demo | Microbial nitrogen fixation  Cyanobacteria, nematodes, tardigrades, collembola, mites | SH + KV  KV + MG + PK | Bokskogen  Forest Veg. Ecology lab |
| Fri 2 Dec | 09:00-10:00  10:00-11:00  13:00-16:00 | Lecture  Lecture  Work on individual assignment | Soil food web ecology  Plant-soil biota interactions and feedbacks | PK  PK | Aspen |

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| **Module 6: The role of biodiversity in ecosystem functioning** | | | | | |
| **Date** | **Time** | **What** | **Topic** | **Who** | **Room** |
| Mon 5 Dec | 09.00-09:15  09:15-11:30  13:00-16:00 | Assignment  Lecture  Assignment | Introduction to assignment on *species and ecosystem functions*  Plant species and functional group effects  Plant economic spectra, nitrogen use efficiency  Own work on the assignment on *species and ecosystem functions* | PK  MG  MG | Bokskogen |
| Tue 6 Dec | 09:00-12:00 | Lecture | Aquatic-terrestrial links and its’ effects on aquatic biodiversity | MM | Bokskogen |
| 13:00-16:00 | Assignment | Own work on the assignment on *species and ecosystem functions* |  |  |
| Wed 7 Dec | 09:00-12:00  Afternoon | Assignment  Own work | Ignite talks and discussions *on species and ecosystem functions* | PK | Sälgen |
| Thu 8 Dec | All day | Group projects |  |  |  |
| Fri 9 Dec | 09:00-10:30  13:00-16:00 | Lecture  Exercise | Statistical data analyses  R - continuous data | Recorded LK  MM | Bokskogen  Datorsal 1A-B  Datorsal 3A |
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| Mon 12 Dec | 09:00-12:00  13:00-16:00 | Exercise  Exercise | R - categorical data  R - ordination | LK  LK | Datorsal 1A-B  Datorsal 3A  P-O Bäckströms sal |
| Tue 13 Dec | 09:00-10:00  10:00-10:15  10:30-16:00 | Lecture  Introduction  Group work | Multi-functionality of terrestrial ecosystems  Group project “Design your boreal biosphere”  “Design your boreal biosphere” | PK  PK + MG | Bokskogen |
| Wed 14 Dec | 09:00-10:00 | Lecture | Biodiversity-ecosystem functioning and ecosystem resilience | MG | P-O Bäckströms sal |
|  | 10:00-11:00 | Group work | “Design your boreal biosphere” |  |  |
|  | 13:00-16:00 | Group projects | Final harvest/data analyses |  |  |
| Thu 15 Dec | 09:00-11:00 | Presentations | “Design your boreal biosphere” | MG + PK | Bokskogen |
|  | 11:00-16:00 | Group projects | Final harvest/data analyses |  |  |
| Fri 16 Dec | 09:00-16:00 | Group projects | Final harvest/data analyses |  |  |

**Christmas break**

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| **Module 7: Global perspectives of forest ecosystems** | | | | | |
| **Date** | **Time** | **What** | **Topic** | **Who** | **Room** |
| Tue 3 Jan | 9.00-10.30  10:30-10:45  11:00-16:00 | Lecture  Assignment | Global changes in forest ecosystem ecology – experiments & methods  Instructions for assignment: Current topics in Forest Ecosystem Ecology – controversies and uncertainties  Own work on the assignment | PK + MK  PK + MK | Bokskogen  Bokskogen |
| Wed 4 Jan | 09:00-12:00  13:00-16:00 | Assignment  Debate | Preparation for debate:  Current topics in Forest Ecosystem Ecology – controversies and uncertainties  Current topics in Forest Ecosystem Ecology – controversies and uncertainties | PK + MK | Bokskogen |
| Thu 5 Jan | All day | Group projects & R drop-in | Analyses of group project data help | MK | Datorsal 1A-B  Datorsal 3A |
| Fri 6 Jan | Epiphany |  |  |  |  |

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| **Module 8: Group projects: data analysis, interpretation, writing, oral presentations + course wrap-up** | | | | | |
| **Date** | **Time** | **What** | **Topic** | **Who** | **Room** |
| Mon 9 Jan | All day | Group projects | Data analyses and report writing | Group leaders |  |
| Tue 10 Jan | All day | Group projects | Report writing | Group leaders |  |
| Wed 11 Jan | All day | Group projects | Report writing + presentation preparation | Group leaders |  |
| Thu 12 Jan | 09:00-12:00  13:00-16:00 | Group projects | Report writing + presentation preparation  Group presentations | Group leaders | Rönnen |
| Fri 13 Jan | 09:00-09:15    09:15- | Wrap-up | Complete the course evaluation + fika  Finish the Group Projects (written report) | MM+PK | Datorsal 1A-B |

AK = Alisa Krasnova

CS = Clydecia Spitzer

JGL = Jose Gutierrez Lopez

JR = Joss Ratcliffe

HL = Hyungwoo Lim

KC = Karina Clemmensen

KV = Kishore Vishwanathan

LK = Lenka Kuglerová

MG = Michael Gundale

MK = Marcus Klaus

MM = Maria Myrstener

MP = Matthias Peichl

MÖ = Mats Öquist

NK= Nataliia Kozii

NH = Nils Henriksson

PK = Paul Kardol

RBH = Ruben Baan Hofman

SH = Stefan Hupperts

TN = Torgny Näsholm

US = Ulf Skyllberg