



PNG0057 Ecosystem functioning: From Theory to Application

Post graduate course, 3 ECTS

For information, send an email to brendan.mckie@slu.se

Date and location

Uppsala, September 2025 (lectures 8-12th)

Course content

The concept of “ecosystem functioning” has over the last three decades stimulated research focussed on what ecosystems do, as opposed to what they are composed of, and is increasingly important in policy and management because of its strong linkages with ecosystem services. Focussing on ecosystem functioning in inland waters (lakes and streams) and terrestrial ecosystems (soils, riparian habitats, agricultural and forest landscapes), this course will cover basic definitions, the relationship between ecosystem functioning and ecosystem services, and several currently topical themes in ecosystem functioning research. These include the roles of functional traits and calculation of functional diversity (including practical exercises in R), multifunctionality, and an overview of biodiversity-ecosystem functioning research. Throughout, a range of practical methods for quantifying ecosystem functioning will be covered, as will the application of these methods in research, biomonitoring and environmental assessment.

Intended learning outcomes

After the course, students should be able to:

- Discuss and evaluate different definitions of ecosystem functioning
- Distinguish the different abiotic and biotic drivers of ecosystem functioning, including biodiversity
- Relate ecosystem functioning to ecosystem services
- Apply the key theoretical underpinnings of ecosystem functioning research in developing or extending a functional perspective on their own research topics
- Identify methods for quantifying ecosystem functioning that are appropriate for their own research topic

- Assess the value of applying ecosystem functioning in bioassessment, particularly in relation to their own research topic, and discuss advantages and possible pitfalls of these approaches

Entry requirement

Students should have an undergraduate degree in environmental science, ideally at an advanced level. Some sections of the course will address deeper aspects of ecological theory, and thus previous courses in basic ecology would be very beneficial, though parts of the course will also be suitable for students with a more limited ecological background who are nevertheless interested in the topic of ecosystem functioning.

Number of course participants

The course requires at least five participants. The maximum number of participants is 15

Plan for the lectures (Provisional)

Lectures (9–12:00 and 13.00–16:00), including morning and afternoon tea-breaks. This will include a workshop on analysis of functional diversity in R. The course will conclude with Student presentations, where they will be asked to address the topic “incorporating or extending ecosystem functioning in their own research”

Confirmed lecturers include:

- Prof. Brendan G. McKie, SLU (General concepts, biodiversity and ecosystem functioning research, functioning in ecosystem assessment)
- Prof. Ryan Sponseller, Umeå University (Whole ecosystem functioning: streams to catchments)
- Dr Francine Hughes (Reader in wetland ecology), Angela Ruskin University, Cambridge (Ecosystem functioning and services in restored wetlands)
- Dr. André Frainer, University of the Arctic, Tromsø (Quantifying functional diversity, including workshop in R)
- Assoc. Prof. Danny Lau, SLU (Biomarkers as tools for investigation of the functioning of food webs)
- Assoc. Prof. Eva Krabb, SLU (Functioning of soil ecosystems under global change)
- Assoc. Prof. Micael Jonsson, Umeå University (Forest multifunctionality)
- Prof. Sara Hallin, SLU (Microorganisms and ecosystem functioning)
- Assoc. Prof. Mohammad Bahram, SLU (Land use and the functioning of soils)

The above lecturer list might change at short notice, and further lecturers might be invited

Literature

No specific textbook is used. Course literature will be distributed prior to the course, and additional hand-outs and supplementary material are distributed during the course.

Examination

To receive full credits for the course, participants should:

- Read the literature provided before the course. The literature consists of recent publications connected to the lectures.
- Give an oral presentation (10-15 minutes) that explains how their own research might be extended by incorporating some of the concepts or methodologies covered in the course. Thus, for students whose projects already focus on some aspect ecosystem functioning, their presentation should explain how new concepts and/or methodological approaches could extend the scope of their research.
- Actively participate in the workshop discussions
- Attend all sessions. While it is permissible to miss sessions, the points awarded will be down weighted according to the number of sessions missed. Note that if there are more than 15 students interested in taking the course, priority will be given to students able to attend all sessions.

Lecturer and examiner

Brendan M^cKie, Associate Professor, Department of Aquatic Sciences and Assessment, SLU

Applications for enrolment:

Send an email to brendan.mckie@slu.se