



Soil ecology and ecosystem services

Lecturers: Teresa Dias and Cristina Cruz (cE3c)

Calendar: January 9th-13th 2017

Duration: 36 hours

Schedule: 9h-13h and 14h00-17h00 Monday to Thursday; 9h-13h and 14h00-18h00 Friday

Lack of fertile land to feed the exponentially growing population, insufficient water availability and quality, changes in the flow of nutrients through the bio-geo-cycles (especially N and P) and climate and land use changes are impacting ecosystems and their capacity to deliver goods and services for humans. It is striking that all these issues interact around one common resource - **SOIL** and its biodiversity. While scientists have long recognized soils as living and of central importance to food production, there is now wide appreciation that they are a foundation for human and ecosystem sustainability. The ecosystem services that flow from soils and their biodiversity include soil formation and renewal of its fertility, maintenance of the composition of the atmosphere through carbon storage and greenhouse gas flux, erosion prevention, the regulation of diseases, the decontamination and bio-remediation of toxic chemicals and habitat and food for a variety of wildlife. Additionally, living soil is a global receptacle of genetic diversity that is yet to be fully explored by humans. Despite this, soils are being degraded at high rates. Policy makers are seeking multiple solutions and need reliable scientific information on soils, their biodiversity and the many services they provide, as well as their resilience under the interacting environmental challenges. Thus, the need for improvement basic skills and their utilization on soils is a true challenge throughout Europe. The advanced course on Soil ecology and ecosystem services (SoilEco) is conceived to give an integrated view of the living component of soils, and its key role on ecosystem functions and processes. Therefore, the course will assess the link between soil biological diversity and ecosystem functions. Relying on different specialists on soil the course is made up of two interrelated strands of work: theoretical and laboratory classes, tuned according to the attendants interests, aiming at the possibility to put in practice their own basic problem on soil ecosystem services.

Objectives: The course SoilEco aims at introducing attendants to an updated state of the art of diversity of the soil biota and the functional roles played by soil organisms in key ecological processes. SoilEco will have the participation of some of the most relevant specialists in the

field and will enable an 'hands on' approach to the study of soil biology and ecology. The course will include both theoretical and practical (laboratory and desk) classes oriented in a problem solving perspective.

General Plan:

Theoretical classes with the participation of specialists (presential or video-conference) on the following subjects:

- (i) The intimate relation between soil ecology and ecosystem services.
- (ii) Key genes and key functions in soil, sequence and consequence.
- (iii) Symbioses - the key for soil biotic assemblages and soil quality.
- (iv) Microbiological methods to assess soil quality.
- (v) Soil threats and bioindicators of soil quality and services.
- (vi) Soil quality, policies and stakeholders.

Each subject will have a coordinator, who will be responsible for the preparation of a background document tailored according to the attendants profile. Soil Eco will count with the participation of facilitators to promote and integrate the subjects under discussion.

Practical classes will be focused on the use of bioindicators of soil quality linked to ecosystem services. Attendants will be organized in groups, will identify a question and will define a minimal data set to assess soil quality or changes on soil quality, which will then be put into action in the laboratory. Finally, they will prepare a presentation of their project's main results, difficulties and conclusions.

| Day | Morning | Afternoon |
|------------------|---|--|
| Monday | 1. The intimate relation between soil ecology and ecosystem services Soil definition, and biodiversity. | 1. Questions about soil quality. Project development (by each group of participants). |
| Tuesday | 2. Key genes and key functions in soil, sequence and consequence. 3. Symbioses - the key for soil biotic assemblages and soil quality. | 2. Project into action Project discussion Soil sampling strategies (ISO). |
| Wednesday | 4. Microbiological methods to assess soil quality. | 3. Processing samples. Soil analyses and standard methods. |
| Thursday | 5. Soil threats and bioindicators of soil quality and ecosystem services. | 4. Continuation of project development. |
| Friday | 6. Soil quality, policies and stakeholders. | 5. Attendants' Presentations Discussion |

This course can have a recognition of 6 ECTs for FCUL PhD students enrolling in it as part of their first doctoral year. For students only requiring 5 ECTs recognized in their specific PhD programmes the last 6 hours of the course are not mandatory and the certificate will be on 'Topics in Soil ecology and ecosystem services'.

Location: Departamento de Biología Vegetal, FCUL

Nº (min, max) students: 8-20

Minimum formation: Bachelor's degree in biology or related areas.

Directed to: The course is targeted for post-graduates studying or working directly on (soil) ecology, or simply interested in increasing their knowledge on this topic.

Fee: free for 1st year PhD students in the Doctoral program in Biology (FCUL), Biodiversity,

Genetics and Evolution (BIODIV UL; UP) and Biology and Ecology of Global Changes (BEAG UL, UA) when the course counts credits for their formation, in which case the delivery of a final report done after the course is mandatory; 25 € for PhD students from institutions of the PEERS network (cE3c, CFE); 125 € for FCUL Master students and unemployed; 180 € for BTI, BI and other PhD students; 250 € for Professional and postdocs.

When the maximum number of students is reached 10 vacancies will be available for non-paying 1st year PhD students mentioned above, being, by order of preference: 1) cE3c students; 2) BIODIV students (not from cE3c); 3) FCUL students (not from cE3c); 4) BEAG students (not from FCUL).

Deadline for applications: November 20th, 2016

Candidates should send a short CV and a motivation letter (including the problem to be solved) to Teresa Dias at the following email address: mtdias@fc.ul.pt