



THE ROLE OF SOIL SEED BANKS IN RESTORATION

2-day student course, SER Europe Conference 2016

Lecturers

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Target audience: Graduate and Postgraduate students to senior scientists willing to know more about theoretical background and practical implementation of seed bank studies

Date: Friday, August 26 to Saturday, August 27, 2016

Location: TUM greenhouse facilities in Dürnast and sampling locations in the field (bus transfer from Freising campus provided)

Course fee: 50,- €

Course summary

In the two day course the lecturers will introduce the audience to the theoretical background and practical implementation of seed bank studies with special focus on restoration. In the first day lectures explain the structure and composition of soil seed banks, how long can seeds retain their viability and what type of analyses help to assess their longevity. The most important methods of seed bank sampling and processing are presented in theory and practice. Both physical seed separation and seedling emergence methods are demonstrated and pros and cons of each method will be discussed. Guidelines for avoiding the most important practical problems like pest control are provided. The participants hear about seed bank composition and density in different habitats and learn basics on developing a seed bank analyses in natural habitats. Practical implementation of seed bank studies as well as methods and problems in the analysis of seed bank data are the topics of the second day. Vegetation of ecosystems adjacent to the glasshouse will be compared to the species combinations emerging from prepared seed bank samples (woodland, productive and dry grassland, arable land; depending on weather, number of participants, time). The choice of a suitable experimental design for different ecosystems and methods to deal with typical problems of seed bank analyses (i.e. clumped distributions, low seed densities) are further topics. Furthermore, also aspects of proper maintenance of soil samples in glasshouses are discussed with an experienced master gardener. The value of different books to identify seeds and seedlings is practiced and evaluated. Study materials and other sources of reference works are provided by the lecturers.

Course schedule

DAY 1 - Introduction into seed banks, sampling methods and analyses (in a lecture room and in the premises of the TUM glasshouse complex Dürnast, from 9 30 to 16 00 with lunch and coffee breaks)

- **Introduction into seed banks** - (What are seed banks, which species groups have seed banks, practical methods for the assessment of the age of seeds. Soil seed banks and other seed banks)
- **The seed bank composition of various communities** (research examples and general trends number of seeds, species composition and seed traits indicate the living conditions in different ecosystems)

Lunch break

- **Why is it necessary to study the seed banks?** (Examples for the applicability of seed bank analyses and research question setting)
- **How can the knowledge on seed banks be used in restoration?** (role of seed banks in restoration with special emphasis on grassland restoration on arable lands)
- **Methods for seed bank analyses I:** The seedling emergence and physical separation methods (details of methods, pros and cons)

DAY 2 - Field work and demonstration (in a lecture room and in the premises of the TUM glasshouse complex Dürnast, from 9 30 to 16 00 with lunch and coffee breaks)

- **Methods for seed bank analyses II:** How to conduct a seed bank analysis? (practical guidelines to perform seed bank analyses)
- **Practical implementation of seed bank sampling**

Lunch break

- **Sample concentration and methods of germination**
- **Data capture in the greenhouse - seedling removal, identification and transplantation**

LECTURER PROFILES



Péter TÖRÖK works about 15 years in the field of plant ecology (seeds, seed banks and vegetation dynamics) and restoration ecology. He is currently employed as associate professor at the Department of Ecology, University of Debrecen, Hungary. He teaches both B.Sc. and M.Sc. courses in the field of plant ecology. He obtained his PhD in 2008 with the topic "the role of seed banks in restoration of acidic grasslands". His current research covers various aspects of plant and restoration ecology with the special focus on mesic and dry grassland habitats.

Selected publications

Sonkoly J., Vojtkó E.A., Tökölyi J., Török P., Sramkó G., Illyés Z., Molnár V.A. (2016): Higher seed number compensates for lower fruit-set in deceptive orchids. *Journal of Ecology*, DOI: 10.1111/1365-2745.12511

Molnár V.A., Sonkoly J., Lovas-Kiss Á., Fekete R., Takács A., Somlyay L., Török P. (2015): High seed viability was recorded even after 131 years of dry storage for the threatened annual legume, *Astragalus contortuplicatus*. *Preslia* 87: 319-328.

Dengler J., Janisová M., Török P., Wellstein C. (2014): Biodiversity of Palaeartic grasslands: a synthesis. *Agriculture, Ecosystems & Environment* 182: 1-14.

Valkó O., Tóthmérész B., Kelemen A., Simon E., Miglécz T., Lukács B., Török P. (2014): Environmental factors driving vegetation and seed bank diversity in alkali grasslands. *Agriculture, Ecosystems and Environment* 182: 80-87.

Valkó O., Török P., Tóthmérész B., Matus G. (2011): Restoration potential in seed banks of acidic fen and dry-mesophilous meadows: Can restoration be based on local seed banks? *Restoration Ecology* 19: 9-15.

Török P., Matus G., Papp M. & Tóthmérész B. (2009): Seed bank and vegetation development of sandy grasslands after goose breeding. *Folia Geobotanica* 44: 31-46.

Further information: <http://ecology.science.unideb.hu/Tpeter/index.html>



Harald ALBRECHT works on soil seed banks for almost 30 years. Here, his main field of research are seed banks in highly disturbed ecosystems like urban areas and arable fields, where frequent disturbance necessitates regular regeneration from the seed bank. Harald is actually employed at the Chair of Restoration Ecology, Technische Universitaet Muenchen, Germany. He teaches B.Sc. and M.Sc. courses in the field of vegetation ecology and conservation. He was appointed to the degree of 'Habilitation' in 2005 on "the diaspore pool of arable fields and its relationship to site conditions and land use". He actually works on the re-introduction of rare arable plants to sites with suitable living conditions, conservation management of rare species in seasonal flooded field depressions and effects of organic farming on plant communities. In all these fields of research seed bank studies are involved.

Selected publications

Altenfelder S., Kollmann J., Albrecht H.: Effects of farming practice on populations of threatened amphibious plant species in temporarily flooded arable fields: implications for conservation management. *Agriculture, Ecosystems and Environment*, in review.

Albrecht, H., Langbehn, T., Tschiersch, C., Eder, E. (2011): The soil seed bank and its relationship to the established vegetation in urban wastelands. *Landscape and Urban Planning* 100, 187-197.

Albrecht, H., Auerswald, K. (2009): Seed traits in arable weed seed banks and their relationship to land use changes. *Basic and Applied Ecology* 10: 516-524.

Albrecht, H. (2005): Development of arable weed seedbanks during six years after the change from conventional to organic farming. *Weed Research*: 339-350.

Albrecht, H. Pilgram, M. (1997): The weed seed bank in a landscape segment in southern Bavaria - II. Relation to environmental factors and to the soil surface vegetation. *Plant Ecology* 131: 31-43.

Albrecht, H., Forster, E. -M. (1996): The weed seed bank of soils in a landscape segment in southern Bavaria. Part I: Experimental site, seed content, species composition and spatial variability. *Vegetatio* 125: 1-10.

Further information: <http://www.roek.wzw.tum.de/index.php?id=81&L=1>