

Standard form for Course plan

Name:	Soil Degradation, Erosion and Restoration.
ECTS:	4
Goals:	To give students state-of-the-art comprehensive knowledge of soil erosion and ecosystem degradation processes and general principles of ecosystem restoration of degraded lands.
Pre-required knowledge:	B.Sc. – M.Sc. level education in natural sciences (biology, geosciences, agricultural sciences, natural resources, environmental sciences or equivalent).
Examination elements:	<ul style="list-style-type: none"> • Graded individual problem solving projects (some in groups) and reporting within main themes during course (40%) • Reports about main elements of two main field trips (20%) • Open book take home examination in home country (40%)
Deadline for after course examination or report:	2 weeks
Pedagogical approach:	<p>Lectures, field excursions and field projects, short student presentations, independent student and group projects (returned and graded during course).</p> <p>The teaching method of SoilSoc courses is problem based. By taking students to Iceland we will give them a chance to learn about erosion in an erosion active environment and how to fight it in an authentic manner.</p>
Scientific content:	<p>Introduction</p> <p>Land degradation and restoration of severe degraded lands is among the most severe problem facing human kind. Soil erosion a widespread problem in Europe and is in fact greater in the Nordic countries than many realize, but is, by far, most severe in Iceland.</p> <p>The Nordic countries allocate substantial resources for soil erosion research and measures and for development aid related to the problem of soil erosion and desertification remedies.</p> <p>The aim of this course is to give students a comprehensive understanding of soil erosion, land degradation, and the scientific knowledge on means to stop erosion and restore degraded lands. The course is designed for students of environmental, natural, agricultural and related sciences. It is also quite suitable for Nordic students interested in</p>

working in the developing countries. The course will also have a Nordic dimension by discussing the role of cryoturbation and geomorphology in soil erosion processes and address open lands and range lands, in addition to cultivated land.

Erosion processes in Iceland are extremely active and is considered among the most pressing environmental problems in the country. Land degradation takes on many forms which makes the location ideal for environmental study of this kind. Iceland has the oldest operating soil conservation agency in the world (Landgræðsla ríkisins - SCSI), with a history full of lessons about ecosystem restoration that can be applied on other parts of the world. Research in the area of soil erosion and ecological restoration is well established with scientists with a broad range of background and practical experience. Scientific endeavors include practical use of research in formulating methods and to survey and solve soil erosion problems (A LbhÍ-SCSI project group led by prof. O. Arnalds received the Nordic Nature and Environment Prize in 1998 for such project). In Iceland, the science of restoration ecology is brought into practical use for planning and carrying out small and large scale restoration projects.

The US scientific background of many of the Icelandic teachers adds new dimension to the Nordic scope of this science.

The course includes extensive field trips using Iceland as a natural laboratory with nature experiences.

Course topics include:

Soil erosion. Processes (wind, water, gravity, cryic processes and geomorphology), identification and mapping of erosion. Erosion research methods and tools (wind and water).

Land degradation. Degradation processes, ecosystem functions and losses; grazing and land degradation. Includes both soil and broader ecological and socio-economical aspects of land degradation in the world. Land degradation, desertification, the global community and UN-environmental conventions. Different methods for evaluation land condition and soil erosion, which include the use of satellite photography and more conventional methods, and land classification.

Ecological restoration. Basic principles of restoration ecology. The “restoration toolbox” and approaches to mitigating soil erosion and restoration of severely degraded

	<p>land. Research and practice of ecological restoration research of severely degraded land. Richly underpinned by examples of halting severe soil erosion and restoration projects in the field in Iceland.</p> <p>Other topics covered (directly or in relation to other topics): Carbon sequestration and land restoration. Synergies (relationships) between UN-global environmental conventions (Climate Change, Biodiversity, Sustainable Development, Desertification etc). Land degradation and development aid. Geomorphology field study. Volcanism in Iceland. The unique volcanic soils of Iceland. Geomorphology of cold areas.</p>
<p>Learning outcome:</p>	<p>Thorough understanding of erosion and degradation processes and skills to begin establish independent soil erosion research. Comprehensive understanding of the many methods to assess land condition and erosion processes and approach and adopt existing methods for other natural conditions in the geographic area of professional work of the student. A broad understanding of degradation process in the world, their effect, ecological consequences, international research and institutional surroundings, including the EU and the UN.</p> <p>State-of-the-art working knowledge of ecological restoration theory and skills to adapt this knowledge to various different conditions. Understanding of how grazing affects ecosystems and contributes to degradation, and of good grazing practices. Understanding of how ecosystem degradation, restoration, and global environmental threats and goals are interlinked.</p>
<p>Added value from non-NOVA teacher(s). Motivation if the number of teachers exceeds 10.</p>	<ol style="list-style-type: none"> 1. Prof. Anton Imeson. University of Amsterdam. Soil erosion specialist with broad international background and participation in large European FP research projects adds valuable dimension to the program for the advanced student. 2. Prof. Steve Archer. University of Arizona, USA. A world renowned US specialist in rangeland ecology and grazing interactions has important value for the Nordic (and EU in general) student, as this science has not progressed in the Nordic countries at the same phase as in the US, Australia etc.
<p>List of teachers if not in the database, incl titles and affiliations. Stress teacher excellence.</p>	<p>Main teachers. See also database.</p> <p><u>Dr. Ólafur Arnalds</u>. Professor, Dean, Environmental Sciences, LbhÍ. Taught Soil Science at University of Iceland 15 years, and numerous classes for professionals and public on soil erosion, soils, land degradation etc.</p>

	<p><u>Dr. Ása L. Aradóttir</u>. Professor, Environmental Sciences, LbhÍ. Established a B.Sc. program in restoration ecology and management and is main teacher in that area at LbhÍ.</p> <p><u>Dr. Anna Gudrun Thorhallsdóttir</u> professor and study line co-ordinator, Environmental Sciences, LbhÍ. Established recent LbhÍ nature and environment study-line, and core teacher at LbhÍ >15 years.</p> <p><u>Also:</u></p> <p><u>Dr. Hlynur Oskarsson</u>. Specialist in ecosystem ecology, teacher of “Icelandic ecosystems” at LbhÍ.</p> <p><u>Berglind Orradóttir</u> (M.Sc.), specialist restoration ecology, LbhÍ.</p> <p>SCSI staff involved include <u>Dr Guðmundur Halldórsson</u>, <u>Dr. Magnus Jóhannson</u>, <u>Dr Andrés Arnalds</u>.</p>
Nordic dimension:	<p>Soil erosion and land degradation occurs in all of the Nordic countries, and is a major environmental problem in some areas. In many places it has lead to severe degradation, sometimes overlooked in Scandinavia, but is very evident in northern part of Scandicanvia, Iceland, the Faroes.</p> <p>The SoilSoc network was established in order to gather a critical mass of scientists, teachers and graduate students for high-quality education in the field of soil related sciences. The aim of the network is to provide a joint forum for M Sc and PhD education. At the PhD level we aim at arranging one field course per year or biannually. The first course was held in Helsinki in June 2006 (Bioremediation of boreal soil at UH-AF, main organiser Kristina Lindström). The course program was built around tools to study and remediate polluted soil environments, emphasizing the role of soils for the well-being of man.</p> <p>The course proposed here is the second SoilSoc course. It addresses a world-wide problem, soil erosion, in cross-disciplinary manner. The site of the course, Iceland, is chosen since it is a unique place in terms of the magnitude of erosion problems, and will utilize the expertise of both local Icelandic teachers as well as SoilSoc teachers from other member universities. By also inviting a couple of non-Nordic experts we will have a top class teaching team..</p> <p>The Icelandic scientific community is small, but in this field it is top class. Thus, our students will not only get a chance to become acquainted with this Nordic country and their fellow colleagues, but they will also broaden their scope internationally and become aware of the importance of soil</p>

protection and ecosystem restoration world-wide.