

03.53.03

Land Reclamation and Restoration

FALL 2016 6 ECTS

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DID YOU KNOW THAT...:

... restoration of damaged ecosystems is an important component of nature conservation?

... there is a growing interest in ecological restoration in urban areas?

... ecological restoration can contribute to sequestration of CO₂ in soils and vegetation, and thus reduce greenhouse gases in the atmosphere?

LAND CONDITION MATTERS

The Earth's ecosystems provide a host of ecosystem services and play a key role in the provision of food and fibre.

Other ecosystem functions—such as flood control and water purification, soil formation and recycling of soil nutrients—are also vital. Furthermore, natural ecosystems provide a host of cultural services, from recreation and tourism to education and aesthetics.

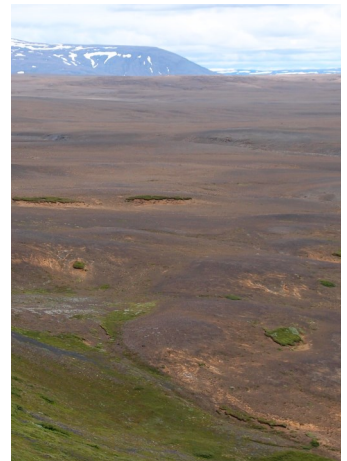
Ecosystem degradation due to overutilization, pollution or other drivers is a global problem. Generally, degraded ecosystems provide less services than ecosystems in good condition.

Ecological Restoration has been defined as the process of

assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed. It is an intentional activity that aims to initiate or accelerate recovery of ecosystems with respect to their health, integrity and sustainability. Ecological restoration is an integral part of both **nature conservation** and **sustainable land use**.

Land literacy, or the ability to assess land condition, is essential for all land users as land management can only be considered sustainable if the condition of the land is taken into account. An understanding of ecosystem characteristics and condition, processes of ecosystem recovery, possi-

ble methods and where they apply is the foundation for design of effective ecological restoration.



Vegetation remnants in this desertified landscape indicate former riches.

LEARNING OUTCOMES

To pass the course, students should:

— have an overview and be able to describe the main tasks of soil conservation and ecological restoration, internationally and in Iceland;

— understand and be able to explain the main processes of land degradation and restoration;

— have a working knowledge of "land literacy";

— recognize and be able to use correctly key concepts in restoration ecology;

— have an overview of the main approaches to halt land degradation and restore damaged ecosystems, and be able to select appropriate approaches under different conditions;

— know the main steps involved in preparation, planning, implementation and evaluation of restoration projects;

— be able to explain the linkages between restoration and soil conservation and global environmental issues such as global warming and protection of biodiversity.

COURSE DESCRIPTION

An introduction to the science and practice of ecological restoration and soil conservation, in Iceland and internationally. Topics include:

- introduction to main tasks and key concepts of restoration ecology and soil conservation;
- soil erosion and land degradation globally and in Iceland;
- “land literacy”;

- processes of land degradation;
- the role of ecological succession in restoration;
- socio-economical and ecological context of restoration projects;
- urban restoration and restoration after disturbances associated with infrastructural interventions (roads, power plants, etc.);

- introduction to the structure and planning of restoration projects;
- history of soil conservation and ecological restoration in Iceland;
- introduction to approaches and methods used in soil conservation and ecological restoration in Iceland;
- synergies between ecological restoration and global environmental issues.

An understanding of ecosystem condition, ecological processes and methods of ecological restoration are the foundations for effective ecological restoration.

SUPERVISION

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In field trips we learn about different aspects of land literacy, land condition and ecological restoration. Here students observe restoration at the Hellisheiði power plant (2013).

ECTS AND PREREQUISITES

Land Reclamation and Restoration is a 6 ECTS mandatory course for students in Forest Science/Restoration Ecology and Nature and Environmental Science / National Parks & Protected Areas programs, but an elective for other programs. Required preparation is 02.06.04 Basic Ecology, or comparable.

ARRANGEMENT

The course includes 35 lectures, one-day field trip, and discussion/project sessions. A schedule of activities is provided on page 4.

There is emphasis on independent studies by project work and reading of the textbook, papers and other assigned materials. Taped lectures (in Icelandic) will be posted on UGLA, with the exception of lectures no. 15-21, which will be held in-class on 7 Sept. Key overheads, readings, etc. will be posted on Moodle.

Comparable material in English will also be posted on Moodle.

Compulsory attendance is on 7, 9, 27-28 Sept. On 9 Sept, we will start with a short exam (~50 min), before embarking upon a field trip. Other days of compulsory attendance will be used for project work, discussion sessions and lectures. Students are expected to follow the lecture plan, listen to the lectures and finish reading assignments within the week they are posted on

Moodle; and should have listen to all assigned lectures and finish reading assignments before each obligatory attendance.

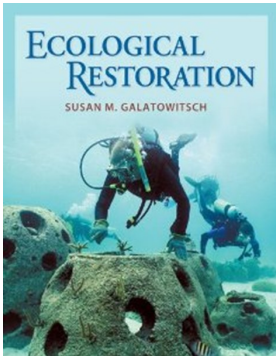
Discussion sessions in English will be held on 30 Aug., 20 Sept. and 4 Oct. at 13-15:10. These are especially set up for foreign exchange students, to clarify the course material and answer questions, but all registered students are welcome to attend.

Expected work

Lectures	23 (35*40 mín)
Project and discussion sessions	9 (13*40 mín)
Field trip	7
Independent student work (projects and reading)	130-140
Total	~ 180

READING MATERIAL

A number of chapters in the textbook **Ecological Restoration** by Susan Galatowitsch, Sinauer Associates Inc. (2012) will be an assigned



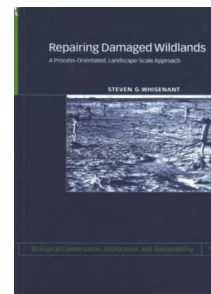
reading for this course. Other readings will also be assigned, mainly scientific papers and book chapters. Additional reading material will also be provided. We will make some use of the book **Að lesa og lækna landið** [To read and heal the land] by Arnalds and Aradóttur (2015), which will be distributed, free of charge, to students. Supplementary material in English will also be made available for students that do not speak Icelandic. An preliminary list of the



reading materials will be posted on Moodle at the start of the semester, but the final details are indicated in overheads for each lecture. y

You might also want to look at the textbook we used

prior to 2013, **Repairing damaged wildlands** by Whisenant (1999). This should be available at the Hvanneyri library. It is a good source and a reference for some of the lectures.



ASSESSMENT

Three projects, total of 35%.
Mid-term exam, 9 Sept., 20%
Written final, 45%
Projects and take-home exams should be prepared

in accordance to guidelines. Failure to do so, and late submissions of reports and projects will affect course work mark.

Students need to have finished all projects and reports with an average grade of 5.0 to be allowed to take the final.

A minimum grade of 5.0 on the final is needed to pass the course.

IMPORTANT DEADLINES

— may be subject to revision —

Assigned	Deadline	Description	% of grade
7 Sept.	26 Sept. (+presentation 27. sept.)	Project 1: Literature review paper and a Power Point presentation: "The restoration toolbox"	23%
9 Sept.	16 Sept.	Project 2: Land literacy; a field trip project	6%
28 Sept.	4 Oct.	Project 3: In-class group discussion project: Preparing a restoration project.	6%



Students planning ecological restoration (project 3).

TIME SCHEDULE 2016
(subject to revision)

Date/Time	Lecture	Subject	Teacher
Week of 22-26 Aug.	1	Introduction and overview of course	ÁLA
Recorded lectures	2	Ecological restoration: why and for whom; tasks, terms and information sources	
	3	Drivers of change and the link of ecological restoration to global environmental issues	
	4	Historical roots of ecological restoration	
	5-8	Restoration of ecosystem function and structure: - ecological function - landscapes, wind and hydrology - cryoturbation (frost action) and ways to reduce its effects - soil condition and soil fertility (+biological soil crusts and its importance)	
Week of 29 Aug.– 2 Sept.	9	Disturbance and ecosystem resilience	ÁLA
Recorded lectures	10-11	Managing ecological succession	
	12-14	Guest lecturer: Ólafur Arnalds: Soil erosion and land condition	ÓA
30 Aug. 13-15:10		Discussion session in English (all students in the course are welcome to attend)	ÁLA
Wed. 7 Sept. 9:00-12:00	15-17	Obligatory attendance – lectures, discussion, etc. Lectures, discussion and a small in-class project (not recorded): Goals, objectives and planning of restoration projects Introduction of project 1: The restoration toolbox	Ása
13:00-15:55	18-21	Guest lecturer: Jóhann Þórsson + discussion (not recorded): Land health and degradation Vegetation history of Iceland	JP
Fri 9 Sept. 9-10		Obligatory attendance – exam and field trip Mid-term exam from lectures 1-14	ÁLA/ÓA
10-16(+)		Field trip—Land literacy. Project 2	ÓA/ÁLA
Week of 12-16 Sept.	22-24	Restoration toolbox: methods and species	ÁLA
Recorded lectures	25-27	Restoration projects: implementation, monitoring and evaluation	
Week of 19-23 Sept.	28-30	Restoration associated with infrastructural interventions	ÁLA
Recorded lectures	31-32	Ecological restoration in urban areas	
	33-34	Ecological restoration in Iceland	
20 Sept.		Discussion session in English (all students in the course are welcome to attend)	
Tue. 27 Sept. 13:00-16:00		Obligatory attendance at Hvanneyri—presentations and discussions Students present the results of project 1	ÁLA
Wed. 28 Sept 9:00-12:00		Obligatory attendance at Hvanneyri—project work, presentations and discussions Project 3—group discussion project about preparation of restoration projects	ÁLA
13-15:10		Presentations of results and discussion	
15:15-15:55	35	Wrap-up and final discussion	
Tue. 4 Okt. 13:00-15:10		Discussion session in English (all students in the course are welcome to attend)	ÁLA