

APF Net Curriculum 5

Restoration of Degraded Forest Ecosystems and Forest Plantation Development

Course Syllabus (PDF)

Semester Year

Course Title:	Restoration of Degraded Forest Ecosystems and Forest Plantation Development
Course Instructors:	Dr. Chris Weston Dr. Luba Volkova

Course Description

This is a course about the principles and practice of tree growth for restoration of degraded forests and for forest plantation development. The course consists of three modules and starts with an overview of elements of forest ecology directly relevant to seed and vegetative regeneration and ecosystem processes related to the growth of a forest. Different stages of stand development are described and an understanding of the impacts of site, climate and soil factors on forest functioning is developed throughout the course. A brief introduction to forest carbon and nutrient cycles is given as essential background to understanding limitations to forest productivity. The second module deals with restoration of degraded forests and starts with a global perspective of the context for restoration activities in different parts of world and the Asia-Pacific region in particular. The properties of degraded forests are described and the aims of restoration activities discussed. The interaction between forest restoration and climate is explored with case studies from tropical and temperate zones, including indicators of restoration success. The third module covers the theory and practice of plantation forest development. The module covers plantation management starting from plantation purpose and species selection to techniques for site preparation, tree establishment and optimizing growth to thinning and pruning.

Course Prerequisites

This course is designed for forest practitioners and for Bachelor students in year 3 or 4 (upper level undergraduate or first year postgraduate) of environmental, natural resource management or forest science degrees. Participants are expected to have studied plant sciences at 1st or 2nd year university degree level; this usually involves the study of biology and chemistry at 1st year university level. The course assumes a familiarity with plant physiology and ecology and the terminology of plant science. A good understanding of forest ecology is the starting point for prescribing management actions for forest restoration or

forest plantation development. To assist students in revising key terminology, links are provided to sources for refresher reading and further information.

Course Format

This course is designed to be taken online over 9-12 weeks with self-paced learning and self-testing at the conclusion of each module. It is envisaged that each module will require 3-4 weeks to complete, allowing for about 50 hours of reading and effort to complete each module (about 13-17 hours per week). The course requires about 150 hours of total time commitment to complete the three modules. The resources can be accessed online by anyone at anytime. Participants will learn through a self-directed learning approach involving group exercises and feedback on quizzes and tests via the online learning system. A course instructor may be available to assist with coordinating the group learning exercises and to provide feedback on individual progress on them.

Course Objectives

The objectives of this course are to introduce you to the theory and practice of: (a) forest restoration and (b) forest plantation development. You need to understand how forests regenerate and develop through stages of maturity, including the emergence of a range of crown classes in a stand. The objectives of this course include revising the ecosystem paradigm and the key ecosystem processes of nutrient cycling and forest productivity, because trees in restored forests and plantations are limited by access to light, water and nutrients.

Relevant components

- Global perspective of ecosystem ecology and the ecosystem paradigm
- Forest productivity and nutrient cycles

After taking this course you should be able to:

- Define and describe the main processes of forest functioning including forest carbon and nutrient cycles
- Recognize and describe properties of degraded forests and principles of forest restoration
- Explain restoration strategies and describe methods to assess success of restoration activities
- Describe in detail all stages in the development of a forest plantation enterprise and give examples from existing plantation projects in the Asia-Pacific region

Course Materials

The course draws on a range of resource materials that are available online or from university libraries. The materials include peer-reviewed journal articles, e-books and reports by government and non-government agencies. Some readings are included in the course materials on the course website. Although the resources are available online, access to all materials will require subscription to a ULS (University Library System), as is granted to

students enrolled in tertiary courses such as bachelor or master degrees. Some materials are available through open access websites such as google scholar.

Examples of textbook readings:

Pretzsch, H. (2009). *Forest dynamics, growth and yield: From measurement to model*. Berlin; London: Springer. ISBN 9783540883074

Stanturf, J.A., Madsen, P., & Lamb, D. (Eds.). (2012). *A Goal-oriented approach to forest landscape restoration*. In World Forests. Dordrecht: Springer. ISBN 9789400753372
eBook: 9789400753389

Rietbergen-McCracken J., Maginnis, S., & Sarre, A. (2007). *The Forest Landscape Restoration Handbook* (eBook). London: Earthscan. ISBN 9781844073696. ISBN: 9781849773010

Whisenant, S., Bradshaw, A.D., Graig, J.L., Jordan, W., Pimm, S.L., Saunders, D. S., & Usher, M.B. (1999). *Repairing damaged wildlands. A process-orientated, landscape-scale approach*. Cambridge: Cambridge University Press. ISBN 9780511053016

Perrow, M.R., & Davy, A.J. (Eds). (2002). *Handbook of ecological restoration:Volume 1 Principles of Restoration*. Cambridge University Press. ISBN 0521791286

Walker, L.R., Walker, J., & Hobbs, R.J. (2007). *Linking restoration and ecological succession* [electronic resource]. New York: Springer. ISBN 9780387353036, 0387353038

Evans, J. (2004). *Plantation forestry in the tropics: The role, silviculture, and use of planted forests for industrial, social, environmental, and agroforestry purposes*. Oxford Univ. Press, 3. ed. XIII, 467 S., Ill., graph. Darst. ISBN: 0-19-850947-2, 0-19-852994-5

Examples of articles from journals:

Ciancio, O., and Nocentini, S. (2011). Biodiversity conservation and systemic silviculture: Concepts and applications. *Plant Biosystems*, 145(2), 411-418.

Peng, S. L., Zhou, T., Liang, L. Y., and Ren, W. T. (2012). Landscape Pattern Dynamics and Mechanisms during Vegetation Restoration: A Multiscale, Hierarchical Patch Dynamics Approach. *Restoration Ecology*, 20(1), 95-102.

Examples of government and non-government readings:

World Wildlife Fund (WWF). (2001). *WWF Living Forests report*. Retrieved from http://wwf.panda.org/what_we_do/how_we_work/conservation/forests/publications/living_forests_report/

Course Schedule

This is a self-directed online course that you can complete at your own pace. The speed at which you progress through the course will depend on how much you already know about forest growth and restoration.

Start Week	Module/Unit	Core Ideas	Learning Activities
Module 1: Forest Ecology. Allow 15-20 hours to complete <u>each topic</u> in Module 1 (about 45-60 hours to complete the module).			

1	Module 1/Topic 1 Forest regeneration, tree and stand growth	Terminology and methods of forest regeneration, tree growth and differentiation into crown classes.	Read background information. Watch online video lectures. Investigate resources. Complete topic 1 reflection questions.
2	Module 1/Topic 2 Forest productivity: carbon cycle	The ecosystem paradigm and the capture of light energy through photosynthesis in the carbon cycle.	Read background information. Watch online video lectures. Investigate resources. Complete topic 2 reflection questions.
3	Module 1/Topic 3 Forest productivity: nutrient cycles	Processes of nutrient cycling as an example of the application of ecosystem ecology.	Read background information. Watch online video lectures. Investigate resources. Complete topic 3 reflection questions. Complete 2 assessed quizzes at the end of the Module.

Start Week	Module/Unit	Core Ideas	Learning Activities
Module 2: Degraded forest systems. Allow 15-20 hours to complete <u>each topic</u> in Module 2 (about 45-60 hours to complete the module).			
4	Module 2/Topic 1 Restoring Degraded Forests – Definition and Context	Properties of degraded ecosystems. Types of restoration, restoration strategies and methods.	Read background information. Watch online video lectures. Investigate resources. Complete topic 1 reflection questions.
5	Module 2/Topic 2 Forest Restoration in Practice	Indicators of forest restoration success.	Read background information. Watch online video lectures. Investigate resources. Complete topic 2 reflection questions. Complete 2 assessed quizzes at the end of the Module.

Start Week	Module/Unit	Core Ideas	Learning Activities
Module 3: Forest Plantation Development. Allow 15-20 hours to complete <u>each topic</u> in Module 3 (about 45-60 hours to complete the module).			
6	Module 3/Topic 1 What is a forest	Plantation purpose, matching species and site.	Read background information.

	plantation		Watch online video lectures. Investigate resources. Complete topic 1 reflection questions.
7	Module 3/Topic 2 Forest plantation establishment	Site preparation, planting and establishment.	Read background information. Watch online video lectures. Investigate resources. Complete topic 2 reflection questions.
8	Module 3/Topic 2 Maximizing Plantation Value	Optimizing plantation productivity and nutrition. Thinning, pruning and regulation of yield.	Read background information. Watch online video lectures. Investigate resources. Complete topic 3 reflection questions. Complete 2 assessed quizzes at the end of the Module.

Course Structure

The course is organized in three Modules and each is comprised of three topics as shown in the table below. Each module typically consists of background information, online video lectures, reading resources, and a self-test. For modules 2 and 3 group exercises will be introduced where students will form teams to prepare a forest restoration plan (module 2) and a plantation development plan (module 3). Students will then present their plans to the other teams by preparing a short video in which each team member explains a component of the plan. These team exercises are designed to encourage interaction between students in the course and to foster collaborative learning.

Module 1: Forest Ecology

Topic 1: Forest Regeneration, Tree and Stand Growth

Topic 2: Forest Productivity - Carbon Cycle

Topic 3: Forest Productivity - Nutrient Cycles

Module 2: Degraded forest systems

Topic 1: Restoring Degraded Forests

Topic 2: Forest Restoration in Practice

Module 3: Forest Plantation Development

Topic 1: What Is a Forest Plantation?

Topic 2: Forest Plantation Establishment

Topic 3: Maximizing Plantation Value

We strongly advise you to study the topics in the order that they are presented, but remember that it is always possible to return to any topic to revise it.

Student Evaluation

Where this course is taken for credit it is weighted as 1/8 of an academic year load. This equates to 170 hours of effort. Assessment is based on the best 5 of 6 quizzes (30%), 2 group video presentations (10% each = 20%), 1 forest restoration plan (25%) and 1 plantation development plan (25%).

Where this course is taken for non-credit, you can assess your learning and understanding of the material through the self-administered test that you will find at the conclusion of each module.

Course Technical Requirements

There are no special technical requirements for taking this course other than being able to access Internet.