Landscape Ecology: Concepts, Methods and Applications

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Centro Franco-Argentino de Altos Estudios de la Universidad de Buenos Aires

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Course contents and timetable

Main objective
To provide the students the basic concepts and methods necessary to deal with a landscape ecology question.

Teaching approach
The course will include morning sessions in which the basics concepts of themes will be exposed to students. There will also be discussion sessions based on the reading material. Concepts and methods will be applied in practice sessions during the afternoon. The evaluation will consist of a monograph that should be based on the contents and readings of the course. Students may choose to develop their monograph on either their thesis projects or as a critical essay based on the contents of the course.

DAY 1: Monday 10 November 2014
The landscape from an ecological standpoint

MORNING SESSION

Course presentation. Aims and scope. Teachers and students introduce each other (30 min)

The diversity of landscapes in space and time/ Why "landscape ecology"? (1 hour, Françoise Burel)

Landscapes vary over the world depending on abiotic factors (geomorphology, climate, natural disturbances, etc.), as well as to past and current human activities (agriculture, transport, urbanization, etc.). It has been shown since a few decades that many ecological processes are controlled by factors operating at intermediate scales, and that landscape structure (fragmentation, connectivity, heterogeneity) plays an important role on them.

Properties of landscapes from the point of view of an ecologist: Landscape metrics and their properties. Space and time relationships (1 hour, Jacques Baudry)

Landscapes exhibit spatial and temporal patterns related to the diversity of their components (fields, woods, etc.). These patterns can be quantified with a large variety of metrics. Some of them, heterogeneity, grain, are presented, as well as their properties. Most of the time these metrics are "scale dependent". Measures vary with the extent of the map on which they are done or with the time frame of the study. These key concepts are explained with examples.

COFFEE BREAK (30 min)

DISCUSSION ON ARTICLES (1 hour)

A collective discussion of papers published in the scientific literature helps to have a better understanding of concepts and methods. This exercise generally demonstrates that different interpretation of the same paper are possible. We will have this exercise three morning, the papers being available for reading on a web site as soon as the students register. Time organization will be:

1) 30 min.: group work; the students constitute groups of 5-6 students to discuss their reading and prepare a 5 min. presentation of 5'.
2) 30 min: for paper presentations by groups and general discussion.

LUNCH BREAK (2 hours)

AFTERNOON PRACTICE

*Landscape maps and landscape metrics in practice* (3 hours, Jacques Baudry)

A good way to get acquainted with landscape maps and metrics is to manipulate them. The practice is based on the use of CHLOE, a freeware developed by H. Boussard and J. Baudry ([http://www6.rennes.inra.fr/sad/Produits/Outils-informatiques/Chloe](http://www6.rennes.inra.fr/sad/Produits/Outils-informatiques/Chloe)), and of maps from the study sites of the team of IFEVA / Facultad de Agronomía, UBA / CONICET. A tutorial is given to the student, so they can practice after the session.

READING MATERIAL


DAY 2: Tuesday 11 November 2014

*Species distribution and populations in landscapes (part 1)*

The question of the relationships between biodiversity and landscapes is addressed in thousands of papers each year. The main points are presented in the next two sessions.

MORNING SESSION

*Fragmented populations and connectivity* (1 hour 30 min, Françoise Burel)

Landscape fragmentation occurs in many places of the world, mainly due to human activities, and it is considered as a major threat for biodiversity. Small and isolated populations are subjected to frequent extinctions and dispersion, which is a key process to mitigate the negative effects of fragmentation. Restoring landscape connectivity to favor species movements between local populations is an aim for nature conservation.

COFFEE BREAK (30 min)

*Landscape heterogeneities and biodiversity* (1 hour 30 min, Jacques Baudry)

Landscape heterogeneity takes a large diversity of forms, the most basic being the land cover heterogeneity, there is also the heterogeneities of land management or the heterogeneities in time. Each affects biodiversity (species distribution, species richness, functional groups...) in a different way. Contrasted examples are given.

GENERAL DISCUSSION (30 min)

At this stage, the students have a general view of the concepts and methods in landscape ecology, so they have questions to clarify the different points they wish to know more about.

AFTERNOON

Students will have free time for reading and practicing landscape analysis.

READING MATERIAL


DAY 3: Wednesday 12 November 2014
Species distribution and populations in landscapes (part 2)

MORNING SESSION

Ecosystem services: regulation, pollination (1 hour, Françoise Burel)
Biodiversity provides many services for human populations, being provision like food or fiber, or regulation like pollination for example. Landscape structure regulates plant and animal populations and then influences the provision of ecosystem services. In agricultural landscapes an emphasis has been put on the role of semi-natural habitats on these services.

Biogeochemical and trophic flows in landscapes. Buffer zones and water quality regulation (1 hour, Jacques Baudry)
Nutrients fluxes are processes occurring in every landscape. In some, it is a source of pollution for both surface and ground water. A great deal of research is done to understand how landscape structure help to control those fluxes.

COFFEE BREAK (30 min.)

DISCUSSION ON ARTICLES (1 hour)

AFTERNOON PRACTICE

How to related observations on biodiversity to landscape characteristics? (3 hours)
We continue with the landscape practice started on the first day, looking at different set of species to establish their relationships with landscape characteristics

READING MATERIAL


DAY 4: Thursday 13 November 2014
Landscape ecology and landscape planning and management

MORNING SESSION

Ecological networks and landscape design (1 hour, Jacques Baudry)
It is widely acknowledged that "protected areas" are not sufficient to protect biodiversity, furthermore they do little for "ordinary species", which fulfill many ecosystem services. Therefore, there is a worldwide movement to design ecological networks to combat fragmentation and to protect a maximum of species. This shift in conservation policies raise a number of question concerning the efficiency of a process based plan, rather than a plan based on species presence. The debate on how to design those networks and, more generally, landscapes to foster biodiversity protection are presented.

Urbanscapes (30-45 min., Françoise Burel)
Urbanization is an ongoing important land use change as more than half of inhabitants of the planet now live in cities. Urban landscapes are highly artificialized and may act as a barrier for biodiversity.
Nature in the city is both a social concern and a natural one, and development of green infrastructures including parks, corridors and private gardens form a green network needed for sustaining biodiversity and associated services.

COFFEE BREAK (30 min)

DISCUSSION ON ARTICLES (1 hour)


Saura, S. and L. Rubio (2010). "A common currency for the different ways in which patches and links can contribute to habitat availability and connectivity in the landscape" Ecography 33: 523-537.

AFTERNOON PRACTICE

A case study of planning in a rural landscape: conflicts between land uses (2 hours)

GENERAL DISCUSSION AND CONCLUSIONS (1 hour)

RECOMMENDED READING


