

Evaluation of Species and Ecosystems

Code: 100842
ECTS Credits: 6

Degree	Type	Year	Semester
2500251 Environmental Biology	OB	3	1

Contact

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Use of languages

Principal working language: catalan (cat)
Some groups entirely in English: No
Some groups entirely in Catalan: No
Some groups entirely in Spanish: No

Teachers

Sergi Pla Rabes
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Prerequisites

There are no official pre-requisites. However, familiarity with the basics of conservation biology as well as with experimental design and statistics are implied.

Objectives and Contextualisation

This subject is an introduction to the evaluation of the effects of human actions on the natural environment, considering this evaluation in its dual aspect of scientific activity and normative environmental evaluation of plans, programs and projects. Its general objectives are to train students in the biological aspects of environmental assessments, concepts and methods applicable to ecological restorations. It also aims to introduce the analysis and the conduct of regulated environmental assessments. The specific objectives are as follows:

- (1) To know the theoretical principles and practical aspects of ecological restorations.
- (2) Understand methods for detecting effects of human actions on the natural environment.
- (3) To know the contents of the environmental assessments, the methods available to them in their biological aspects (species, habitats and ecosystems), and the applicable legislation.
- (4) To recognize environmental impacts and introduce students to procedures that assist in decision making that minimize the environmental impact
- (5) To be aware of the main mitigating measures of impacts.

Skills

- Adopt an ethical stance.
- Apply ICT resources pertaining to this field of study.
- Carry out services and processes related to environmental biology.
- Describe, analyse and assess the natural environment.
- Develop a sensibility towards environmental issues.
- Direct, draft and execute projects in environmental biology.
- Focus on quality.
- Make decisions.
- Participate in environmental impact assessments regarding the biological medium.
- Perform biological diagnoses.
- Solve problems.

Learning outcomes

1. Adopt an ethical stance.
2. Apply ICT resources pertaining to this field of study.
3. Correctly process information on biological aspects to support environmental impact studies and environmental assessments.
4. Describe and assess the biotic components affected by a project.
5. Develop a sensibility towards environmental issues.
6. Establish the conceptual content and the methodological requirements for solving a specific environmental problem.
7. Focus on quality.
8. Identify effects of human interventions on species and their habitats.
9. Make decisions.
10. Participate in the monitoring of environmental surveillance programmes.
11. Solve problems.

Content

Valoració d'espècies i ecosistemes: General contents of the subject 2018-2019

0. Introduction to Valoració d'espècies i ecosistemes. Justification of the program and the proposed activities. Organization and structure of the program. Relationships with other subjects of the degree. Activities and their evaluation. Bibliography.

A. Environmental assessment as a scientific activity

1. Experimental designs to detect and evaluate impacts. Reasons for experimental designs and their goals. Ideal designs: controls, replication and randomization. Identifying the problem. Designs to use when replication or randomization are not feasible. CI Design (Control-Impact). BA Design (Before-After). Simple BACI design. Association and causality.

B. Restoration Ecology

2. Introduction to Restoration Ecology and Ecological Restoration: the essentials. Definitions. Reasons to carry out a restoration. Restoration of species, soil, habitats and ecosystems. **Restoration Ecology and Ecological restoration.**

3. What should we have in mind when designing a restoration? Foundations and current objectives of the restoration. Introduction to ecosystem processes and theories. Ecosystem services and their preservation. Case studies.

4. River restoration. Rivers as ecosystems: their elements and dynamics. What drives degradation. The fluvial space. Zonation of the river space. Stages in the restoration of rivers. Examples are river restorations and other actions on river systems. **Bioengineering** Definition and examples of bioengineering techniques for restoration.

5. Restoration of wetlands. Definition and types. The value of wetlands. Loss of wetlands: causes of destruction and degradation. Controlling factors. Stages in the restoration of wetlands. Creation of wetlands: constructed wetlands. Examples and case studies.

C. Environmental assessment as a normative instrument.

6. Basics environmental assessment. Environmental evaluation of plans and programs: strategic environmental assessment. Environmental assessment of projects: environmental impact assessment (EIA): stages of the process. The environmental impact study (EIS). Declaration of environmental impact.

7. Identifying the impacts: quantitative assessment and evaluation. Methods of identification of impacts. Methods for identifying impacts: identification lists, cause-effect matrices, network diagrams. Methods for quantitative evaluation of the magnitude of impacts: habitat suitability models, population feasibility analysis. Assessment of impacts and significance.

D. Selection of alternatives.

8. Methods for selection of alternatives. Multicriteria analysis, simple methods: Selection of alternatives. Selection of criteria. Scoring of alternatives. Weighting of criteria. Aggregation of results. Advanced Methods: The Hierarchical Analytical Process

E. Mitigating measures.

9. Measures to mitigate the environmental impacts of a project and biodiversity compensations. Precautionary measures. Corrective measures. Compensatory measures. Environmental Monitoring Program. Biodiversity offsets: Conservation Banks, Land Custody

F. Further theory but for which practices?

10. What theoretical foundations would help tomorrow's managers to sustain healthy ecosystems?

Methodology

The methodology used to achieve the learning process is based on the students working on the information relevant to the subject. The role of the teacher is to guide the students in their learning, stimulating reflection and discussion. Depending on the case, the teacher provides the necessary information directly or indicates where to find it. The class combines lectures, group discussions, assignments and practical classes:

(1) Lectures, where concepts and methods of the discipline are presented and explained. It will alternate with text discussion, usually by groups, on articles and documents (environmental impact assessments), with subsequent team presentations. The lectures will highlight and address the most complex and important points for each didactic unit, and case studies will be analyzed. Subsequently, the student, based on that conceptual map, can supplement it with bibliographic information during his/her independent work. Lectures will last 50 minutes, making the audiovisual material prepared by the teacher available in the Virtual Campus.

(2) Assignments to be conducted by students, will be oriented to apply to practical cases, concepts and methods explained in lectures.

(3) Computer-based labs models for evaluating species reintroduction actions will be used.

(4) Field trips: visits to places where ecological restoration actions have been carried out.

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			

Classroom lectures and discussions	35	1.4	4, 7, 8, 10, 6, 9, 11, 5, 3
Computer lab	3	0.12	2, 8, 11
Field trips	16	0.64	10, 11, 5, 3
Type: Supervised			
Analytical work of an EIA	50	2	2, 7, 8, 9, 11, 5, 3
Type: Autonomous			
Study	42	1.68	4, 8, 10, 6, 5, 3

Evaluation

The course will be evaluated according to the following parts:

Final written tests (50% of the total score). Obtained from the average evaluation of the two mid-term written tests. Written tests will also evaluate the topics covered during the practical sessions.

Critical analysis of an EIA (35% of the total score) applying the concepts and methods explained in the theory. This activity will be scored as follows:

5% - student review of the critical analysis draft made by other students

10% - evaluation of the critical analysis draft made by the student (under evaluation). Review comments for later implementation to be provided by the teacher.

20% - evaluation of the final version of the work, with all proposed changes implemented. A comment sheet explaining how comments have been implemented in the final version must be provided.

Other Aap (Learning activities: case study resolution and preparation of discussion, 15% of the mark) - This part will assess: 1) each of the resolutions of the case study analysis sessions (2 in total) that corresponds of 5% of the final mark (10%), and 2) the participation and resolution of the debate proposal that will correspond to the last 5% of the evaluation.

In order to pass the student's grade, weighted as stated above, needs to be at least 5 (over 10), and the average for both mid-term exams (3 and 4) not less than 4 (over 10). If the average for both mid-term exams does not reach 4 the student will have the possibility to do a final exam (that corresponds to 50% of the grade if the score is more than 4 over 10). To be eligible for the retake process, the student should have been previously evaluated in a set of activities equaling at least two thirds of the final score of the course or module. Thus, the student will be graded as "No Avaluable" if the weighting of all conducted evaluation activities is less than 67% of the final score". For the rest of assessment activities, you do not need to obtain any minimum mark to make an average.

Attendance to practical sessions (or field trips) is mandatory. Students missing more than 20% of programmed sessions will be graded as "No Avaluable".

The non-delivery of any of the assignments within the established period implies a zero score for that activity.

Students who are unable to attend an individual test for a justified reason (such as illness, accident or death or grave illness or accident of a first-degree relative) and provide the official documentation to the Degree Coordinator, will be entitled to take the test at a different date.

Evaluation activities

Title	Weighting	Hours	ECTS	outcomes
1. First mid-term exam	25	2	0.08	1, 4, 7, 8, 6, 9, 11, 5, 3
2. Second mid-term exam	25	2	0.08	7, 8, 10, 6, 9, 11, 5, 3
3. Critical analysis of an EIA	35	0	0	2, 1, 4, 7, 8, 9, 11, 5, 3
4. Case study resolutions and other assignments, preparation and participation in discussions	15	0	0	2, 1, 4, 7, 8, 10, 6, 9, 11, 5, 3

Bibliography

SUGGESTED LITERATURE

(A) Experimental design and criteria to detect effects in the environment

Downes BJ et al (2002) Monitoring ecological impacts: Concepts and practice in flowing waters. Cambridge university Press. *Available as e-book and in the library of Facultat de Ciències i Biociències.*

Osenberg CW, et al, 2006. In: Falk D, et al., (eds). Foundations of restoration ecology. Island Press, Washington. *Available in the library of Facultat de Ciències i Biociències.*

(B) Ecological restoration and restoration ecology

Parker M, Zedler J, Falk D, 2016. Foundations of restoration ecology. 2nd edition. Island Press, Washington. *Available on net*

Falk D, et al., 2006. Foundations of restoration ecology. Island Press, Washington. *Available in the library de la Facultat de Ciències i Biociències i a internet.*

Howell EA, Harrington JA, Glass SB, 2012. Introduction to restoration ecology. Island Press. *Available in the library de la Facultat de Ciències i Biociències*

(C) Environmental assessment

Glasson J, Therivel R, Chadwick A, 2005. Introduction to environmental impact assessment. Routledge, London. *Disponible a la biblioteca de la Facultat de Ciències i Biociències.*

CIEEM, 2016. Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, 2nd edition. Chartered Institute of Ecology and Environmental Management, Winchester. *Disponibles a Internet*

Gontier M, Balfors B, Mortberg U, 2006. Biodiversity in Environmental Assessment-Current Practice and Tools for Prediction. Environmental Impact Assessment Review 26 (3): 268-286. *Disponible a internet.*

(D) Value assignment

Lawrence DP, 2007. Impact significance determination - back to basics. Environmental Impact Assessment Review 27: 755-69. *Disponible a internet.*

Lackey RT, 2004. Normative science. Fisheries Forum 29:37-39. *Disponible a internet.*

Others books and documents

Environmental assessment

Conesa Fernández-Vitora V, 2010. Guía metodológica para la evaluación del impacto ambiental. Mundi-Prensa. 4a edició. Madrid.

DMAH, 2010. Balanç i perspectives de l'avaluació ambiental a Catalunya. Manuals d'avaluació ambiental, 4. Departament de Medi Ambient i Habitatge, Generalitat de Catalunya. *Disponible al web sobre avaluació ambiental del Departament de Territori i Sostenibilitat.*

Garmendia A, i cols., 2005. Evaluación de impacto ambiental. Ed Pearson Educación, Madrid, 396p.

Guía para la elaboración de Estudios Ambientales de proyectos con incidencia en el medio natural. [Són 8 guies, numerades 0 a 7]. Dirección General de Medio Natural de la

Gómez Orea D., 2003. Evaluación de impacto ambiental, un instrumento preventivo para la gestión ambiental. 2a edició ampliada. Editorial Mundi-Prensa. Madrid, Barcelona, México, 749p.

Kiker GA, i cols., 2005. Application of multicriteria decision analysis in environmental decision making. *Integrated Environmental Assessment and Management* 1: 95-108.

Morgan RK, 2012. Environmental impact assessment: the state of the art. *Impact Assessment and Project Appraisal* 30: 5-14.

Saaty TL, 2000. Fundamentals of the analytic hierarchy process. RWS Publications, Pittsburgh, Pennsylvania.

Suggested Webs on environmental assessment

1. Asociación Española de Evaluación de Impacto Ambiental - www.eia.es
2. Banc de dades d'avaluació ambiental - mediambient.gencat.cat/ca/05_ambits_dactuacio/avaluacio_ambiental/participacio_publica/banc_de_dades_dav
3. Consejería de Industria y Medio Ambiente de la Región de Murcia - www.ambiental-sl.es/descargas
4. Departament de Territori i Sostenibilitat (Generalitat de Catalunya) --> Medi ambient i sostenibilitat --> Empresa i avaluació ambiental -> Avaluació ambiental de plans, programes i infraestructures
5. European commission - http://ec.europa.eu/governance/impact/index_en.htm
6. International Association for Impact Assessment - www.iaia.org
7. Ministerio de Agricultura, Alimentación y Medio ambiente- www.magrama.gob.es/es/calidad-y-evaluacion-ambiental/temas/evaluacion-ambiental

Scientific journals

Impact Assessment and Project Appraisal - www.tandfonline.com/toc/tiap20/current

Environmental Impact Assessment Review - www.journals.elsevier.com/environmental-impact-assessment-review

Restoration ecology

Agència Catalana de l'Aigua (2008a) La gestió i recuperació de la vegetació de ribera. Guia tècnica per a actuacions en riberes. http://aca-web.gencat.cat/aca/documents/ca/actuacions/vegetacio_ribera_complerta.pdf

González del Tánago M, García de Jalón D, 2007. Restauración de ríos. Guía metodológica para la elaboración de proyectos. Ministerio de Medio Ambiente.

Howell EA, Harrington JA, Glass SB, 2012. Introduction to restoration ecology. Island Press.

Magdaleno F, 2011. Manual de técnicas de restauración fluvial. Segunda edición. CEDEX, 294 p.

Montes C, Rendón-Martos M, Varela L, Cappa MJ, 2007. Manual de restauración de humedales mediterráneos. Consejería de Medio Ambiente. Sevilla. *Disponible a internet*.

Perrow MR, Davy AJ, 2002. Handbook of ecological restoration. 2 vols. Cambridge University Press, Cambridge.

Prat N, Puértolas L, Rieradevall M, 2008. Els espais fluvials. Manual de diagnosi ambiental. Diputació de Barcelona.

Rey Benayas JM, Espigares Pinilla T, Nicolau Ibarra JM, 2003. Restauración de ecosistemas mediterráneos. Universidad de Alcalá, Alcalá de Henares.

Webs on Restoration

1. Society for Ecological Restoration - www.ser.org
2. MedWet: The Mediterranean Wetlands Initiative - www.medwet.org
3. CIREF: Centro Ibérico de Restauración Fluvial - www.cirefluvial.com
4. European Centre for River Restoration - www.ecrr.org

Scientific journals on restoration

Restoration Ecology - <https://onlinelibrary.wiley.com/journal/1526100x>

Ecological Management and Restoration <https://onlinelibrary.wiley.com/journal/14428903>

other scientific journals

Conservation biology - <https://onlinelibrary.wiley.com/journal/15231739>

Forest Ecology and Management - <https://www.journals.elsevier.com/forest-ecology-and-management>

Journal of Applied Ecology - <https://besjournals.onlinelibrary.wiley.com/journal/13652664>

Trends in Ecology and Evolution - <https://www.cell.com/trends/ecology-evolution/home>

Wetlands - <https://www.springer.com/life+sciences/ecology/journal/13157>