



IDENTIFYING DATA

Forestry Ecology

Subject	Forestry Ecology			
Code	P03G370V01402			
Study programme	(*)Grao en Enxeñaría Forestal			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Cordero Rivera, Adolfo			
Lecturers	Cordero Rivera, Adolfo Rivas Torres, Anaís Sobrino García, María Cristina Villamaña Rodríguez, Marina			
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General description	(*)A Ecoloxía é a ciencia que estudia a resposta dos organismos ás variacións ambientais, dende o nivel individual ao ecosistema. Esta materia ten como obxectivos proporcionar os coñecementos básicos da Ecoloxía, con especial referencia ao ambiente forestal.			

Competencies

Code	
B1	CG-01: Capacidade para comprender os seguintes fundamentos necesarios para o desenvolvemento da actividade profesional: Biolóxicos.
B2	CG-02: Capacidade para comprender os seguintes fundamentos necesarios para o desenvolvemento da actividade profesional: Físicos.
B3	CG-03: Capacidade para comprender os seguintes fundamentos necesarios para o desenvolvemento da actividade profesional: Químicos.
B6	CG-06: Capacidade para identificar os diferentes elementos: elementos bióticos.
B7	CG-07: Capacidade para identificar os diferentes elementos: elementos físicos.
B8	CG-08: Capacidade para identificar os diferentes elementos: recursos naturais renovables susceptibles de protección, conservación e aproveitamento.
B9	CG-09: Capacidade para analizar a estrutura e función ecolóxica dos sistemas e recursos forestais, incluíndo as paisaxes.
B10	CG-10: Coñecemento dos procesos de degradación que afecten aos sistemas e recursos forestais: contaminación.
B11	CG-11: Coñecemento dos procesos de degradación que afecten aos sistemas e recursos forestais: pragas.
B13	CG-13: Coñecemento dos procesos de degradación que afecten aos sistemas e recursos forestais en xeral.
B16	CG-16: Capacidade para o uso das técnicas de conservación da biodiversidade.
B17	CG-17: Capacidade para avaliar e corrixir o impacto ambiental.
C12	(*)CE-12: Capacidade para coñecer, comprender e utilizar os principios de: ecoloxía forestal
D1	(*)CBI 1: Capacidade de análise e síntese.
D6	(*)CBI 6: Adquirir capacidade de resolución de problemas.
D15	(*)CBS 3: Creatividade.
D20	(*)CBS 8: Sensibilidade cara a temas ambientais.

Learning outcomes

Expected results from this subject	Training and Learning Results
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CE12: Capacity to know, understand and use the principles of Ecology in Forestry. Capacity to know, understand and use the concept of ecosystem. CE03 Ability to understand and apply the evolutionary theory in forest management. CE04 Ability to know and develop demographic analyses in Forestry. CE05 Ability to identify and use ecological interactions in the analysis of forest ecosystems. CE06 Capacity to know, understand and maintain biological diversity in exploited forest ecosystems. CE07 Capacity to develop analyses of energy and matter fluxes in forest ecosystems. CE08 Ability to understand the implications of ecological succession in the management of forest ecosystems. CE09 Ability to know, analyse and control the negative effects of pollution on forest ecosystems. CE10 Ability to know, understand and use ecological principles in the exploitation of populations and control of forest pests. CE11 Capacity to know, understand and use basic principles of conservation biology on the management of forest ecosystems	B1 B2 B3 B6 B7 B8 B9 B10 B11 B13 B16 B17	C12	D1 D6 D15 D20
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New

Contents

Topic

0. ORGANIZATION DO COURSE. FORESTS AND FOREST PLANTATIONS.	Development of the subject. Techniques of evaluation of the student: objectives and methods. Forests and plantations: differences and similitudes. The principles of Forest Ecology.
SECTION I. 1. INTRODUCTION TO ECOLOGY.	The concept of sustainability. The demographical problem (implications of human growth population on natural resources). Introduction to Ecology. Levels of biological organization and subdivisions of Ecology. The concept of ecosystem. Forest Ecology and the principle of determinism. The scientific method. Introduction to ecological economics (National accounting and the loss of natural resources. The ecospace and the ecological footprint). Ecology and environmentalism.
SECTION II. THE ENVIRONMENT. 2. THE MATCH BETWEEN ORGANISMS AND THE ENVIRONMENT.	Genotypic and phenotypic variation. Natural selection. Ecotypes. Concept of resource and ecological factor. Ecological effects of solar radiation (Photosynthesis, index of foliar surface, morphology, shadow tolerance, photoperiodism). The temperature and the organisms (Q10, diapause, physiological time, effects on plants, adaptations of plants to unfavourable temperatures). Atmospheric humidity and vegetal adaptations. Effects of the wind on vegetation (dissemination of reproductive propagules, physiological effects, morphological effects). Adaptations to fire.
3. FOREST IMPLICATIONS OF BIOLOGICAL ADAPTATION.	Implications of evolutionary concepts in the exploitation of forests. Importance of the factor light in forestry. Importance of the factor temperature in forestry. Importance of water in forestry. Importance of the wind in forestry.
SECTION III. ECOLOGY OF POPULATIONS. 4. DEMOGRAPHY.	Concept of population. Unitary and modular organisms. Construction and analysis of life tables. Survivorship curves. Age pyramids. Populational growth (geometrical growth, mathematical models, intrinsic rate of growth, innate capacity of increase). Populational growth and intraspecific competition: concept of carrying capacity. Analysis of key factors.
5. INTERACTIONS (I): COMPETITION AND PREDATION.	Theory of niche: concept, multidimensional approach. The relationship between niche and habitat. Type of interactions between organisms. Intraspecific competition (exploitation, interference, densodependency, population regulation, asymmetry). Allelopathy. Interspecific competition (logistical model, model of Tilman). Principle of competitive exclusion. Character displacement. Type of predators. Model of Lotka-Volterra. Examples in the laboratory and the field. Strategies in the search of food. Functional responses. Coevolution prey-predator. Mechanisms of defence of the prey (physical defences, chemical, crypsis, aposematism, mimicry). Interaction herbivores-plants.
6. INTERACTIONS (II): MUTUALISM AND DETRITIVORY.	Concept of mutualism. Types of mutualism (behaviour, care, polinización, intestinal, symbiosis, mycorrhizas). Lichens. Leguminous plants and Rhizobium. Decomposers: Bacteria and fungi. Soil detritivores (earthworms, insects). Aquatic detritivores. Relative role of microflora and detritivores. Interactions detritivore-resource (vegetal detritus, faeces, carrion).
SECTION IV. ESTRUCTURA AND ORGANIZATION OF ECOSYSTEMS. 7. THE BIOLOGICAL COMMUNITY.	Concept. Characteristics of the community. Physical structure (stratification, forms of growth, biomass). Seasonality (Temperate zones, tropical zones). Concept of ecotone (effect of border, ecotones between forests and grasslands). Concept of guild.
8. DIVERSITY IN FOREST ECOSYSTEMS.	Concept and type of diversity. Why preserve biodiversity? The measure of the biodiversity (index of Shannon, rank-abundance plots). Latitudinal gradient of biodiversity. Main forest activities and their effect on biodiversity. Techniques for maintaining biodiversity in forest plantations. Principles of eco-forestry.

9. PRIMARY PRODUCTIVITY.	Production and respiration (biomass, net and gross production). Type of photosynthesis (plants C3, C4 and CAM). Methods to measure primary productivity. Quimiosynthesis. Limiting factors of primary productivity (terrestrial and aquatic communities). Relation Productivity:Biomass in natural ecosystems. The productivity of forest ecosystems (factors that affect forest NPP; NPP of forests and monocultures).
10. FLOW OF ENERGY.	Thermodynamics. Trophic levels. Trophic chains and nets. Ecological pyramids. Diagramas of flow of energy. Storage and dynamic of the energy in ecosystems. Effects of the exploitation of forests in the flow of energy.
11. CYCLES DE MATTER.	Circulation of the matter. Biogeochemical cycles (P, N, S, C, the greenhouse effect). Cycles of elements in forest ecosystems (effect of the age of the trees, of the type of ecosystem, of the type of tree, effects over production, additions and losses of nutrients, effects of the extraction of wood on long-term productivity).
12. THE ECOLOGICAL SUCCESSION.	The succession (primary/secondary, alogenic/autogenic/biogenic, degradative). Hypothesis on succession and the concept of climax. Mechanisms behind succession (colonization, alteration of the environment, species displacement). Sucessional models (Horn, Tilman). Changes in the functioning of the ecosystems during the succession. Examples of sucessions (abandoned fields, cyclic succession). Importance of the succession in the exploitation of the forests.
SECTION V. APPLIED ECOLOGY.	Definition. Types of pollutants. The acid rain (effects of the sulphur compounds on plants and animals: the decline of forest ecosystems). The hole in the layer of ozone. Noise. Water pollution. Bioindicators of water quality. Eutrophication (Causes, recovery of eutrophic lakes).
13. POLLUTION.	
14. EXPLOITATION AND CONTROL OF POPULATIONS.	Concept of maximum sustainable yield. Models of exploitation (fixed quota). Principles about the exploitation of populations (regulation of the effort of exploitation, instability, exploitation of a percentage, dynamic models). The exploitation of the forests. Techniques of pest control (aims, chemical control, biological control, genetic control, integrated control).
15. BASIC PRINCIPLES OF CONSERVATION BIOLOGY.	The number of species that inhabit the planet. The value of the species and ecosystems (intrinsic, instrumental, peculiarity). Processes and causes of extinction (historic extinctions, antropic effects). Management of ecosystems. Social, economic and political factors.
16. INTRODUCCIÓN TO THE ENVIRONMENTAL IMPACT ASESMENT (EIA).	Fundamentals, terminology and definitions. Objectives of the EIA. Phases of the EIA. Methods and models to define the relation cause-effect.
Practicals in the classroom.	Methods and devices of sampling (devices for air, plants, soil, and water sampling). Methods of mark-recapture (index of Lincoln, method of Jolly). Relative estimates (selective predation, progressive predation, captures by unity of effort).
1. METHODS IN FIELD ECOLOGY: mobile populations.	
Practicals in the classroom.	Quadrats. Transects. Linear interception. Punctual interception. Method of the quadrats centered in a point. Spatial distribution (patterns of distribution). Experiment: sampling of a simulated community of plants.
2. METHODS DE WORK EN ECOLOGY DE FIELD: sessile populations.	
Practicals in the computer room.	Variability of body size in different types of organisms. Concept of allometry. Types of allometry. Examples. Study of problems to determine of the existence of allometry.
3. ECOLOGICAL IMPORTANCE OF BODY SIZE: ALLOMETRY.	
Practicals in the laboratory.	Methods of determination of the age in different type of organisms.
4. METHODS DE DETERMINATION OF AGE.	Growth of the organisms. Experiment: studio of the growth in different tree species.
(*)Práctica de laboratorio.	(*)Utilización do método Winkler para a determinación da actividade fotosintética e respiratoria
5. METABOLISMO MICROBIANO	
Field practicals. 1. Forest pests.	Density of <i>Gonipterus scutellatus</i> on <i>Eucalyptus</i> , and biological control by means of its parasitoid <i>Anaphes nitens</i> .
Field practices. 2. Estimation of water quality in the river Almofrei by means of biological methods.	The use of bioindicators to study river water quality.

Planning

	Class hours	Hours outside the classroom	Total hours
Master Session	30	45	75
Outdoor study / field practices	9.8	14.7	24.5
Laboratory practises	9	13.5	22.5
Classroom work	7	10.5	17.5
Practice in computer rooms	3	4.5	7.5
Short answer tests	2	0	2

Troubleshooting and / or exercises	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Master Session	Class room lectures.
Outdoor study / field practices	Field work in forest ecosystems
Laboratory practises	Laboratory practical lectures
Classroom work	Class room work
Practice in computer rooms	Simulations of ecological systems in the computer room

Personalized attention	
Methodologies	Description
Master Session	

Assessment					
	Description	Qualification	Training and Learning Results		
Master Session	A final written examination will be used to evaluate the work done over the course.	70	B1 B6 B8 B9 B10 B11 B13 B16	C12	D1 D6 D20
Outdoor study / field practices	(*)Avaliarase no exame escrito da materia	8	B1 B6 B8 B9 B10 B11 B13 B16	C12	D20
Laboratory practises	(*)Avaliarase no exame escrito da materia	6	B1 B6 B8 B9 B10 B11 B13 B16	C12	D6
Classroom work	(*)Avaliarase no exame escrito da materia	10	B1 B6 B8 B9 B10 B11 B13 B16	C12	D6
Practice in computer rooms	(*)Avaliarase no exame escrito da materia	6	B1 B6 B8 B9 B10 B11 B13 B16	C12	D6

Other comments on the Evaluation	
Sources of information	
Basic Bibliography	

Complementary Bibliography

Kimmins, J. P., **Forest Ecology**, 2,

Sevilla Martínez, F., **Una teoría ecológica para los montes Ibéricos**,

Cordero Rivera, A. (editor), **Proxecto Galicia: Ecoloxía**, vol. 44,

Terradas, J., **Ecología de la Vegetación**,

Molles, M.C., **Ecology: concepts and applications**, 6 (only until 4th edition available on the Library),

Barnes, B. V., Zak, D. R., Denton, S. R. & Spurr, S. H., **Forest Ecology**, 4,

Begon, M., Harper, J. L. & Townsend, C. R., **Ecología**,

Rico Boquete, E., **Política Forestal e Repoboacións En Galicia. 1941-1971**,

Recommendations

Subjects that continue the syllabus

Management of protected areas and biodiversity/P03G370V01801

Subjects that it is recommended to have taken before

Botany/P03G370V01303

Edaphology/P03G370V01302

Mathematics: Statistics/P03G370V01301

Forest entomology and Zoology/P03G370V01305