

**APPLIED LANDSCAPE ECOLOGY 2023**

← → ↻ 🏠 <https://www.isa.ulisboa.pt/ceabn/content/2/80/homepage> 🏠 🌐

HOME ABOUT US CONTACTS LINKS 🌐 🌐

**Centro Ecologia Aplicada**  
 "Prof. Sampaio" 🌿

RESEARCH AREAS TEAM PROJECTS PUBLICATIONS SCIENCE AND SOCIETY NEWS & EVENTS

**Centro de Ecologia Aplicada**  
 The Centre for Applied Ecology "Prof. B. Sampaio" is a research centre within the School of Agriculture, University of Lisbon. It presents Biodiversity and Evolutionary Biology Research at the University of Porto.  
 It is located in the old house of Professor Sampaio, who pioneered Nature Conservation.

BIODIVERSITY IN AGRICULTURAL AND FOREST ECOSYSTEMS  
 ECOLOGICAL DESIGN AND LANDSCAPE ARCHITECTURE  
 FIRE ECOLOGY AND MANAGEMENT  
 WILDLIFE MANAGEMENT  
 AGRO-ENVIRONMENTAL EDUCATION AND DISSEMINATION OF RESEARCH RESULTS

**News and Events**

09/02/2022  
 We invite everyone to Sinergias with Joana Marcelino  
 Friday, February 11, 2022. This time at room 33, in the main ISA building

09/02/2022  
 Would you like to do a master's thesis on insect herbivory in cork oak seedlings?  
 We are looking for a master's student for the thesis "Impact of herbivory by cattle and insects on the survival of cork oak seedlings"

09/02/2022  
 The final report of the RECIPE project has just arrived  
 The impact of climate change on natural risk management by civil protection, fires, floods, storms, avalanches, rockfalls and landslides

02/12/2021  
 Annual meeting INTERREG SUDOE COMFOR project at ISA  
 COMFOR "integrated and intelligent information management of complex forests and mixed-species plantations in southwest Europe"

EPA 2023 [Centro Ecologia Aplicada \(ulisboa.pt\)](https://www.isa.ulisboa.pt/ceabn/content/2/80/homepage)

## TODAY....

**PART 1** - Course presentation (Apresentação da unidade curricular)

**PART 2** - Preparing next classes (Preparação das próximas aulas)

EPA 2023

## HOJE....TODAY....

**PART 1** - Course presentation (Apresentação da unidade curricular)

**Número de créditos: ECTS atribuídos – 7,5**

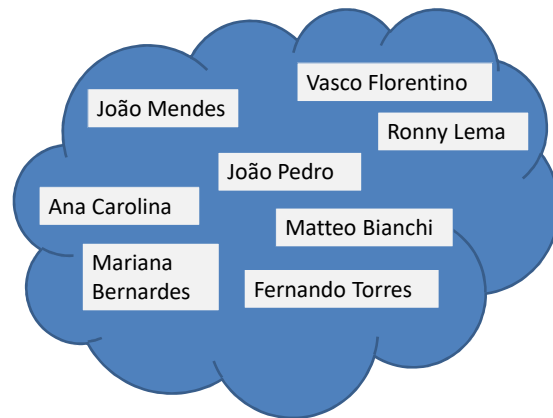
- 1,5 h teóricas + 3,5 horas Teórico-práticas: 70h presenciais; in common classes – theoretical and practical
- 5 horas de trabalho semanal individual: 70 h individual /autonomous work

EPA 2023

## PART 1 Course presentation (Apresentação da unidade curricular)

Quais as expectativas para as aulas de EPA?

Students and their expectations towards EPA ?

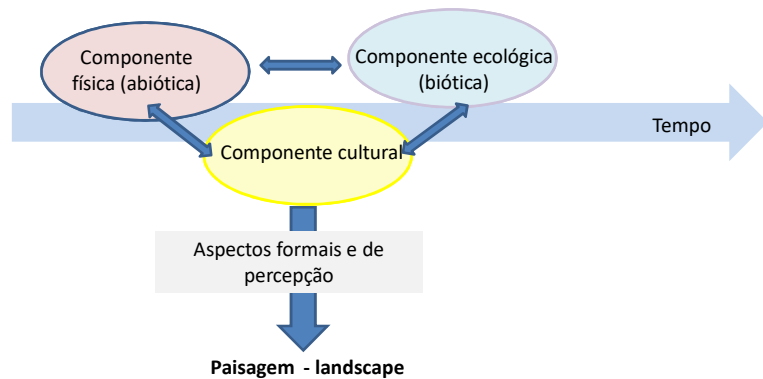


EPA 2023

**Paisagem** - componente fundamental do património Natural, histórico, cultural e científico, criando uma identidade (europeia) única (Convenção Europeia da Paisagem - Conselho da Europa, 2000 – Landscape European Convention – *search the definition of landscape*)

**Paisagem** - Sistema dinâmico onde os diferentes factores naturais e culturais interagem e evoluem em conjunto, determinando e sendo determinados pela estrutura global, o que resulta numa configuração particular, nomeadamente de relevo, coberto vegetal, uso do solo e povoamento, o que lhe confere uma certa unidade e à qual corresponde um determinado carácter (Cancela de Abreu et al., 2005)

- **Landscape** can be defined as a heterogeneous land area composed of cluster of interacting ecosystems, or mosaics of interacting patches of different types



EPA 2023

## APPLIED LANDSCAPE ECOLOGY

Ecologia da Paisagem Aplicada 2023

- Landscape features, elements
- Landscape structure



Points

Lines (and nodes)

Mosaics

Polygons,

patches

Gradients (?)

## APPLIED LANDSCAPE ECOLOGY

Ecologia da Paisagem Aplicada 2023

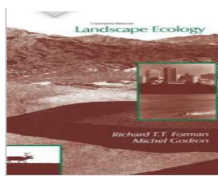


**Ecologia da Paisagem** - ciência transdisciplinar e holística que combina a dimensão espacial e horizontal das abordagens geográficas, com a dimensão funcional e vertical das abordagens ecológicas (Car Troll, 1939)

**Landscape ecology is the study** of the reciprocal influences of pattern (structure) on processes(function) and change (dynamics) of those interactions through time. Landscape structure should be quantified to understand the relationships of pattern with ecological processes.

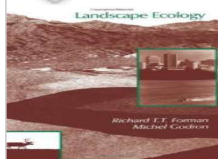
EPA 2023

**APPLIED LANDSCAPE ECOLOGY**  
*Ecologia da Paisagem Aplicada 2023*



Richard T. T. Forman and Gordon

- Introduz os conceitos de Ecologia da Paisagem:
  - Estrutura
  - Função
  - Mudança
- Considera parte integrante da paisagem Animais, Plantas, Solo, Meteorologia, Pessoas, Uso do solo, etc.
- 1986



Richard T. T. Forman and Gordon

- Introduz os conceitos de Ecologia da Paisagem:
  - Estrutura
  - Função
  - Mudança
- Considera parte integrante da paisagem Animais, Plantas, Solo, Meteorologia, Pessoas, Uso do solo, etc.
- 1986

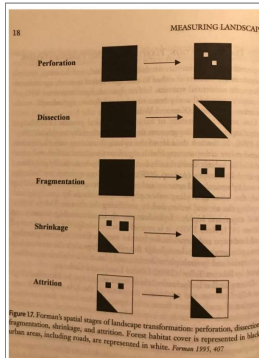
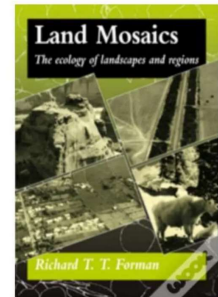


Figure 17. Forman's spatial stages of landscape transformation: perforation, dissection, fragmentation, shrinkage, and attrition. Forest habitat cover is represented in black; urban areas, including roads, are represented in white. Forman 1995, 407

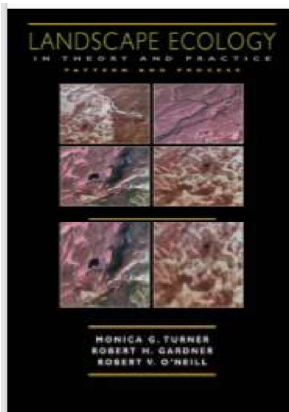
Richard T. T. Forman



- 1995

EPA 2023

**APPLIED LANDSCAPE ECOLOGY**  
*Ecologia da Paisagem Aplicada 2023*



Monica Turner *et al*

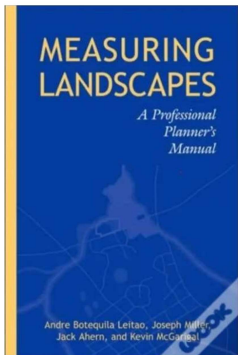
- Ecologia da paisagem tem crescido devido à sua utilidade na avaliação das alterações ambientais que estão a ocorrer de forma rápida e em grande escala
- Padrões existentes são um fenómeno ecológico cuja alteração neste equilíbrio pode resultar na ocorrência pragas e doenças e consequentes eventos de extinção de populações;
- Padrões resultam da interação complexa de diversos factores bióticos e abióticos e das perturbações que ocorrem na região;
- Padrões resultam da interação complexa de diversos factores bióticos e abióticos e das perturbações que ocorrem na região;

- 2002. Yellowstone

TABLE 2.1. DEFINITIONS OF SCALE-RELATED TERMINOLOGY AND CONCEPTS.

Term	Definition
Absolute scale	Actual distance, direction, shape, and geometry.
Cartographic scale	Degree of spatial reduction indicating the length used to represent a larger unit of measure; ratio of distance on the map to distance on Earth's surface represented by the map, usually expressed in terms such as 1:10,000. In cartography, large scale means fine resolution and small scale means coarse resolution.
Critical threshold	Point at which there is an abrupt change in a quality, property, or phenomenon.
Extent	Size of the study area or the duration of time under consideration.
Extrapolate	To infer from known values; to estimate a value from conditions of the argument not used in the process of estimation; to transform information (1) from one scale to another (either grain size or extent) or (2) from one system (or data set) to another system at the same scale.
Grain	Finest level of spatial resolution possible within a given data set.
Hierarchy	System of interconnections or organization wherein the higher levels constrain and control the lower levels to various degrees depending on the time constraints of the behavior.
Holon	Representation of an entity as a two-way window through which the environment influences the parts and parts communicate as a unit to the rest of the universe (Koenigler, 1967).
Level of organization	Place within a biotic hierarchy (e.g., organism, deme, population).
Relative scale	Transformation of absolute scale to a scale that describes the relative distance, direction, or geometry based on some functional relationship.
Resolution	Precision of measurement; grain size, if spatial.
Scale	Spatial or temporal dimension of an object of process, characterized by both grain and extent.

EPA 2023



André B. Leitão *et al*

- Ecologia da Paisagem tem raízes comuns com a Ecologia e com a Biogeografia
- Utilidade da ciência e da métrica de Ecologia da Paisagem no planeamento e no ordenamento do território

• 2006

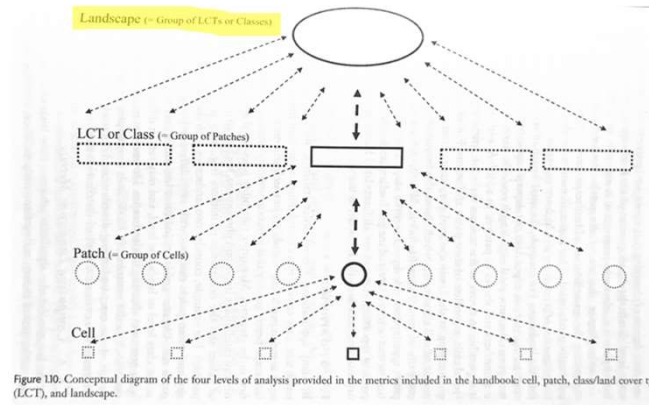
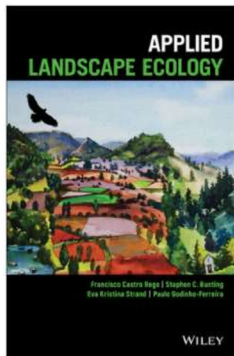


Figure 110. Conceptual diagram of the four levels of analysis provided in the metrics included in the handbook: cell, patch, class/land cover type (LCT), and landscape.

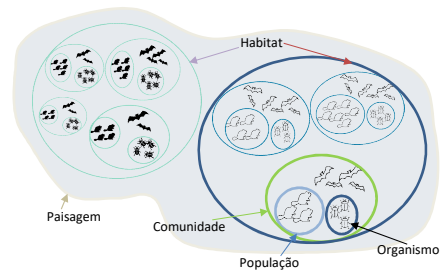
EPA 2023



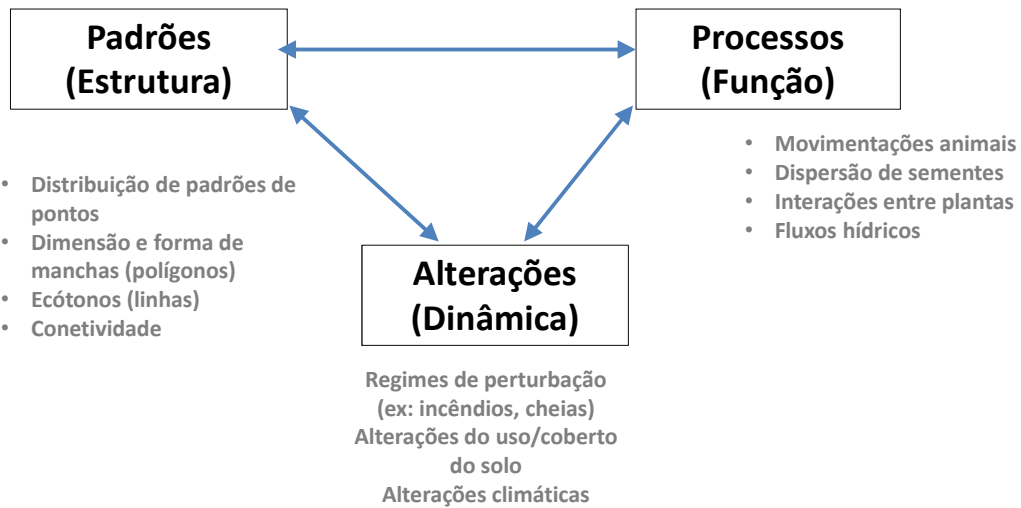
Francisco C. Rego *et al*

- Escrevem a história da Ecologia da Paisagem enquanto disciplina, descrevem os seus métodos quantitativos de análise de dados, direcionado principalmente a estudantes

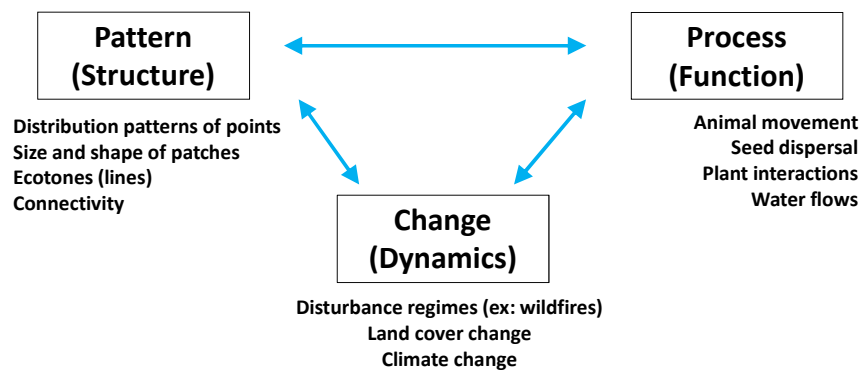
• 2019



EPA 2023



EPA 2023



Applied Landscape Ecology: analysis of landscape patterns, processes and dynamics

EPA 2023

## Objectives (Objectivos)

- students cement and deepen the knowledge they have previously acquired about ecology and landscape
- students can solve real practical situations and questions together, using the concepts and tools of Landscape Ecology, verifying the interest and advantage of their use.
- students resort to the use of computer tools already known, namely Geographic Information Systems and Pattern Analysis.

EPA 2023

## Course Plan, Syllabus (Conteúdo da unidade curricular)

### PART 1 - ANALYSIS OF PATTERNS TO UNDERSTAND PROCESSES

#### ANÁLISE DE PADRÕES PARA ENTENDER OS PROCESSOS

- Wildfires:**
- Are a landscape driver, and
  - Explore Resources (e.g., vegetation, habitats, food) as many animal species



#### Analysis of distribution patterns of points in the landscape

- Distribution patterns of fire ignitions with quadrat analysis

#### Analysis of landscape selectivity for points and polygons

- Wildfire (ignitions and burned areas) selectivity per land cover class
- Habitat selection of species with conservation concern (e.g. Iberian lynx)

#### Analysis of line and patch patterns (size, shape)

- Hedgerows and other linear structures
- Analysis of size and shape of perimeters and burned patches



## Course Plan, Syllabus (Conteúdo da unidade curricular)

**PART 1 - ANALYSIS OF PATTERNS TO UNDERSTAND PROCESSES****Analysis of distribution patterns of points in the landscape**

- Distribution patterns of fire ignitions with quadrat analysis

**Analysis of landscape selectivity for points and polygons**

- Wildfire (ignitions and burned areas) selectivity per land cover class
- Habitat selection of species with conservation concern (e.g. Iberian lynx)

**Analysis of line and patch patterns (size, shape)**

- Hedgerows and other linear structures
- Analysis of size and shape of perimeters and burned patches

**PART 2 - ANALYSIS OF DYNAMICS (CHANGES IN PATTERNS AND PROCESSES THROUGH TIME)**

- Analysis of temporal changes in land cover and burned areas using transition matrices: past dynamics and simulations for the future
- Presentation of case studies

EPA 2023

## Evaluation and criteria (Métodos de avaliação e critérios)

**Continuous evaluation (Avaliação contínua)****1) Two Working group assignments (2-3 students/group) (60% of final grade)****Dates for document delivery and oral presentation (datas para entrega e apresentação oral):**

- 4th April
- 9th May

**2) One Individual assignment (30% of final grade)****Date for document delivery and oral presentation (datas para entrega e apresentação oral):**

- 23th May

**3) Class attendance and participation (10% final grade)****Exam evaluation (Avaliação por exames)**

**One exam:** questions to solve individually at home, using data and other available documents  
(1 Exame em 1ª, 2ª época e Época Especial)

**Exams for students with continuous evaluation score/grade below 9,5/20**

**Minimum grade for exam approval: 10/20** (Nota mínima de 10 para aprovação no exame)

EPA 2023

**APPLIED LANDSCAPE ECOLOGY***Ecologia da Paisagem Aplicada 2023*

## Class Schedule (planeamento das aulas)

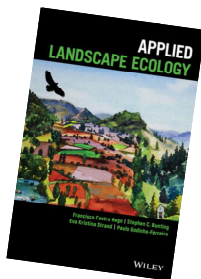
Date	Theoretical (8:30-10h a.m)	Practical (10:00-13:30h)
14 February	Course presentation	Preparation of practical class and group assignments
<b>21 February</b>	Carnival	Carnival
28 February	Patterns of points in the landscape; the scale effect	Practical example: analysis of fire ignitions with quadrat approach. Distribution, quantification and aggregation index;
7 March	Analysis of landscape selectivity for points and polygons	Practical example: wildfire (ignitions points and burned areas) selectivity per land cover class; quantification of land cover class area, ignition point location and fire ignition selectivity
14 March	Analysis of landscape selectivity for polygons. Conclusion. Examples of landscape selectivity using wildlife	Practical example: wildfire selectivity. Conclusion. Quantification of fire extent and burned area; wildfire selectivity per land cover class; comparing with data on fire ignitions ; discussion of results.
21 March	Line patterns, distributions and density	Practical example: Hedgerow typology in agricultural landscape matrix. Implications for management
28 March	Shape patterns. Conclusion of the previous exercises;	Practical example: Fire extent and burned scars, shape index analysis and discussion. Preparing first group presentation; doubts clarification
<b>4 April</b>	First Assignment – Group presentation and discussion	Examples of LE applications
<b>11 April</b>	<b>Férias da PÁSCOA -- Easter holidays</b>	<b>Férias da PÁSCOA -- Easter holidays</b>
18 April	Landscape dynamics and burned areas	Exercise with land cover changes (1995-2015), using transition matrices
<b>25 April</b>	<b>Feriado – Holiday</b>	<b>Feriado – Holiday</b>
2 May	Simulation of land cover evolution and dynamics; Landscape diversity and resilience	Scenarios for the study area landscape: fire effect; analyses by Markov chain approach
<b>9 May</b>	Second Assignment - Group presentation and discussion	Preparation of the individual assignment: case study selection, objectives and methods; oral presentation
16 May	Oral presentation of real case studies; discussion and doubts clarification	Landscape ecology and ecological design: practical applications;
<b>23 May</b>	Final Assignment – Individual presentation and discussion; self-evaluation of the course by students and teachers	

**APPLIED LANDSCAPE ECOLOGY***Ecologia da Paisagem Aplicada 2023*

## Bibliography (Leituras recomendadas)

• **Principal - Main**

- ❑ Rego, F.C.; Bunting, S.C.; Strand, E.K.; P. Godinho-Ferreira (2018). *Applied Landscape Ecology*. Wiley, 1<sup>ª</sup> ed. 265 pp.

• **Secundária – secondary, complementary**

- ❑ Gergel, S.A., and M.G. Turner (eds.) (2017). *Learning Landscape Ecology. A practical guide to concepts and techniques*. Springer.
- ❑ Turner, M.G., R.H. Gardner, R.V. O'Neill (2001). *Landscape Ecology in Theory and Practice*. Pattern and Process. Springer.
- ❑ Leitão, A.B., Miller, J., Ahern, J. K. McGarigal (2006) *Measuring Landscapes. A Planner's Handbook*. Island Press.
- ❑ Mazzoleni S., di Pasquale G., Mulligan M., di Martino P., Rego F. (2004) *Recent Dynamics of the Mediterranean Vegetation and Landscape*. John Wiley & Sons
- ❑ Forman R.T.T. (1995) *Land Mosaics: The Ecology of Landscapes and Regions*. Cambridge University Press.



## Informação útil

**Se estiver a passar por alguma dificuldade socioeconómica, académico-pedagógica ou de saúde, pode contar connosco:**

- Associação de Estudantes (**AEISA**) | telefone: 21 365 3319, e-mail: apoioaestudante@aeisa.pt
- Em condições de deficiência visual, auditiva, motora / doença crónica / autismo / doença psicológica ou psiquiátrica / dificuldades de aprendizagem / outras dificuldades de saúde o estatuto de Estudante com Necessidades Educativas Especiais (Estudante-**NEE**) prevê um conjunto de apoios. Para informações telefone: 21 365 3119; e-mail: [enee.apoio@isa.ulisboa.pt](mailto:enee.apoio@isa.ulisboa.pt)
- Para assuntos relacionados com discriminação contacte Comissão para a Igualdade e Inclusão e Não Discriminação (**CIGI**) do ISA: [cigi@isa.ulisboa.pt](mailto:cigi@isa.ulisboa.pt)

### Pode também recorrer ao

- Centro Médico da **Ulisboa** <https://www.estadio.ulisboa.pt/info/centro-medico> que inclui o Serviço de Apoio Psicológico: <https://www.estadio.ulisboa.pt/atividade/psicologia>

### Pode ser útil consultar:

- Regulamento de Apoio ao Estudante com Necessidades Educativas Especiais do ISA disponível em: [https://www.isa.ulisboa.pt/files/da/pub/docs/regulamentos/Regulamento\\_Estudante\\_-NEE\\_ISA\\_2022.pdf](https://www.isa.ulisboa.pt/files/da/pub/docs/regulamentos/Regulamento_Estudante_-NEE_ISA_2022.pdf)
- *Flyer* da Campanha Ansiedade e Depressão disponível em: [https://www.estadio.ulisboa.pt/sites/estadio.ulisboa.pt/files/activity/docs/flyer\\_ansiedade\\_depressao.pdf](https://www.estadio.ulisboa.pt/sites/estadio.ulisboa.pt/files/activity/docs/flyer_ansiedade_depressao.pdf)



ISA

## Take note:

**If you are experiencing any socio-economic, academic-pedagogical or health difficulties, you can count on us:**

- ISA Students' Association (**AEISA**) | telephone: 21 365 3319, e-mail: apoioaestudante@aeisa.pt
- In conditions of visual, hearing, motor disability / chronic illness / autism / psychological or psychiatric illness / learning difficulties / other health difficulties the status of Student with Special Educational Needs (Student-**NEE**) provides a set of supports. For informations telephone: 21 365 3119; e-mail: [enee.apoio@isa.ulisboa.pt](mailto:enee.apoio@isa.ulisboa.pt)
- For issues relating to discrimination, contact the ISA's Commission for Gender Equality, Inclusion and Non-Discrimination (**CIGI**): [cigi@isa.ulisboa.pt](mailto:cigi@isa.ulisboa.pt)

### You can also contact

- **Ulisboa Medical Centre** <https://www.estadio.ulisboa.pt/en/info/medical-centre> that provides psychological support: <https://www.estadio.ulisboa.pt/en/atividade/appointment>

### You may find it useful to consult:

- ISA Students with with Special Educational Needs available at: [https://www.isa.ulisboa.pt/files/da/pub/docs/regulamentos/Regulamento\\_Estudante\\_-NEE\\_ISA\\_2022.pdf](https://www.isa.ulisboa.pt/files/da/pub/docs/regulamentos/Regulamento_Estudante_-NEE_ISA_2022.pdf)



ISA

## Part 2 – Preparing for next classes

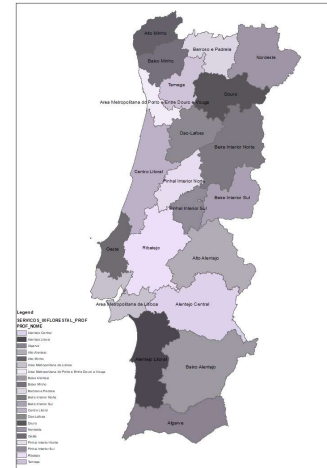
### SELECTION OF STUDY AREA TO PERFORM COURSE EXERCISES

Regiões PROF (Programas Regionais de Ordenamento Florestal)  
(Administrative Regions for Forest Planning and management)  
<http://www2.icnf.pt/portal/florestas/profs>

7 Active PROFs (after a revision in 2019 of the 21 former PROFs):

EDM - Entre Douro e Minho;  
TMAD - Trás-os-Montes e Alto Douro;  
CI - Centro Interior;  
CL - Centro Litoral;  
LVT - Lisboa e Vale do Tejo;  
ALT - Alentejo;  
ALG - Algarve

Each working group needs to select one region  
(among the former 21)



[PROF - sub-regiões \(icnf.pt\)](http://www2.icnf.pt)

EPA 2023

## Part 2 – Preparing for next classes

Working in groups (of 2-3 students)  
Trabalho de grupo (2 -3 elementos)

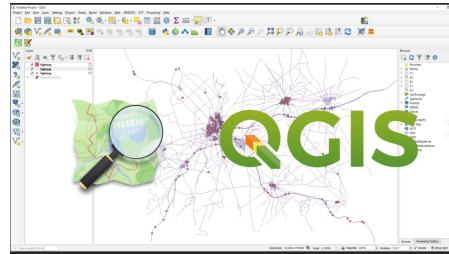
Student Name	Grupo	PROF selected
Ana Carolina Antunes Laranjeira	1	Centro Interior
Fernando Tomé dos Reis Torres	2	Entre Douro e Minho
João Mendes Ramos da Silva	3	Algarve
João Pedro Coelho Silva	2	Entre Douro e Minho
Mariana dos Santos Pinto Bernardes	3	Algarve
Matteo Bianchi	1	Centro Interior
Ronny Dario Quijia Lema	4	Trás-os-Montes ou Alentejo?
Vasco de Oliveira Lourenço Florentino	4	Trás-os-Montes ou Alentejo?

EPA 2023

**Part 2** – Preparing for next classes**WORKING WITH IMAGES, GIS****INSTALL AND TEST QGIS**

<https://www.qgis.org/en/site/forusers/download.html>

- Computer
- S.I.G. software (preferably QGIS;  
ArcGIS can also be used, if preferred)



[Download QGIS](https://www.qgis.org/en/site/forusers/download.html)