# Faculty of Environmental Sciences

Final State Examinations for Master Programmes – Thematic Areas

2024

# Nature Conservation - field

**All thematic areas are compulsory.**

<u>**CONSERVATION BIOLOGY**</u>

## 1. Biological diversity (BD) and threats to BD

1. Patterns of BD ant its levels: genetic diversity (its expression and measurement), species diversity (and its measurement), ecosystem diversity, patterns of species diversity, examples of the most diverse ecosystems (and the reasons for such diversity there).
2. Economic values of BD (direct and indirect). Ethical values and arguments for preserving BD.
3. Extinctions – past and human-caused (frequencies, range, rates and impacts, examples), estimating extinction rates, vulnerability of species to extinctions
4. Threats to biodiversity – habitat fragmentation/degradation/destruction/loss, invasive alien species, overexploitation, climate changes, diseases, natural disasters etc.

## 2. Conservation at the population, species and landscape levels

5. Problems of small populations – the drivers of genetic variability (GV) loss, consequences of reduced GV, minimum viable population, effective population size, demographic variation, environmental variations and catastrophes, gene flow, extinction vortices.
6. Island biogeography model in nature conservation (NC).
7. Concept of metapopulations, sink-source theory, habitat traps.
8. Species recovery programmes / actions plans and establishing of new populations – translocations, repatriations, restocking, examples, conditions.
9. *Ex situ* conservation strategies – the roles of gene banks, zoos, aquariums, botanical gardens, arboretums in nature conservation.
10. Red lists and Red books and their roles in nature conservation, categories of threatened species. Using population viability analysis (PVA) in species conservation. Umbrella species, flagship species.
11. Protected areas (PAs) – the IUCN system of classification of PAs, examples of PAs.
12. Designing PAs – size, shape and other relevant characteristics of PAs.
13. Practical measurements (management) in PAs (case studies, examples).
14. Nature conservation outside protected areas – the value of unprotected areas, nature conservation in urban areas and other types of landscapes (case studies).
15. The role of Ecological Restoration and Restoration Ecology in nature conservation, examples.

**Literature**

- Primack R. B. 2004: **A Primer of Conservation Biology**. Third edition (and newer). Sinauer Associates, Sunderland, USA.

Moodle – Conservation Biology course.

**ECOSYSTEM CONSERVATION AND MANAGEMENT**

1. **Ecosystem management:** What is ecosystem management? Concepts of conservation of ecosystems. Natural and seminatural habitats in Central (and western) Europe (problems). Describe main principles and types of habitat management (add some examples).
2. **Conservation and Management of Agroecosystems:** changes of ecosystems of agriculture landscape depending on management changes, environmental problems of agroecosystems, endangered species and their protection - examples of species, tools of agro-politic systems in EU, agro-environmental measures to support agricultural landscape.
3. **Conservation and Management of Grasslands:** types of use of grasslands - main differences in structure and in biodiversity, differences in grazing animals, grazing as a tool for habitat management, types of grazing, negative factors affecting grasslands and their biodiversity in Europe, management and its positive effects on grassland biodiversity.
4. **Conservation and Management of Heathlands:** geographical distribution of heathlands in Europe, characteristic species on heathlands, ecology of Calluna vulgaris, Calluna life cycle and its importance in conservation management, management tools and their principles.
5. **Conservation and Management of Inland Salt Marshes:** formation of salt marshes, necessary abiotic conditions, typical vegetation - how we call them, adaptations to conditions, examples, causes of threats, negative factors, management tools and principles of habitat management (restoration and regulation management).
6. **Conservation and Management of Inland Sands and Sand Dunes:** formation of these ecosystems, abiotic conditions, typical species - how we call them, life forms, examples, causes of threats and negative factors, restoration and regulation management. Old sand pits - restoration principles, importance for biodiversity, conservation and management.
7. **Conservation and Management of Rocks-stands and Quarries:** importance for biodiversity, ecological conditions, characteristic species, problematic of technical reclamation, risks, spontaneous succession.
8. **Conservation and Management of Sandstones:** importance and distribution of sand stones, biodiversity of sand stones, ecological islands, risks and negative factors, specifics of conservation of sand stones areas, problems with tourism.
9. **Management and Conservation of Wetlands**: types of wetlands, important convention on wetlands, the role of fishponds in the landscape and main characteristics, history, actual functions of fishponds and their importance of fishponds for water birds, intensification of fishponds (consequences, threats), natural vs. managed processes in fishpond ecosystems.
10. **Conservation of streams:** the most important causes of threat, conservation of biotopes of watercourses, revitalisation of streams, examples of threatened species and their protection, migration barriers on streams, non-native and expansive species on streams and around streams.
11. **Conservation and Management of Forest Ecosystems:** structure and dynamics of natural forests, the importance of dead wood in forest ecosystem, natural forest

regeneration, principles of ecological management, factors affecting biodiversity in forest ecosystems.

**Literature**

- Ausden M. 2007: **Habitat Management for Conservation: A Handbook of Techniques**. Oxford University Press.

Moodle – Ecosystems Conservation and Management.


## ANIMAL AND PLANT AND CONSERVATION

1. Mutual and exclusive traits of animals, world's biodiversity of animals.
2. Adaptations, exaptations, genotype, heredity and heritability, mutations, phenotypic plasticity, fitness, natural selection.
3. Genetic diversity and polymorphism, genes under selection, local adaptations, inbreeding and outbreeding, founder effect, bottleneck.
4. Life history traits, life strategies, r- and K- selection, trade-off principle.
5. Behavioral ecology, cooperation, kin selection, game theory and evolutionary stable strategies.
6. Chemical communication.
7. Asexual and sexual reproduction – costs and benefits, gonochorism and hermaphroditism, sex determination and sex reversal, sexual dimorphism.
8. Mating systems, sexual conflict, mechanisms of sexual selection, role of signals, sperm competition.
9. Reproduction strategies, hybridization and hybridogenesis, assortative mating.
10. Migration and dispersal. Navigation in animals.
11. Niche concept, habitat selection, territoriality and home range, intraspecific competition.
12. Evolutionary ecology of host-parasite interactions, pathogenicity and virulence.
13. Theory of island biogeography and metapopulation concept, effects of habitat fragmentation, habitat edges and ecological traps on animal populations, Allee effect.
14. Modularity in plant species.
15. Pollination and mating systems in plants.
16. Hybridization and polyploidization in plants.
17. Spreading in space and time.
18. Life cycles, strategies and population dynamics of plants.
19. Clonal growth.
20. Intraspecific and interspecific competition in plants.
21. Plant community structure: competition and disturbance.
22. Communities and succession.
23. Theory of island biogeography.


**Literature**

Moodle – courses Plant Ecology and Conservation, Animals Ecology and Conservation

**CONSERVATION POLICY**

1. Conservation policy – definition and key approaches to it; nature conservation as a social activity, its basic instruments, approaches and targets; main nature conservation fundamental paradigms in the past and present (wilderness, nature as a heritage monument, nature´s balance, biological diversity, sustainable development, ecological/ecosystem integrity, ecosystem services).
2. Geopolitical conditions of nature conservation; global ecology v. global change ecology; biodiversity loss main drivers at the global, EU and national level; challenges and limits conservation policy.
3. National nature conservation laws, EU nature conservation legislation, multilateral agreements related to nature conservation (e.g., Convention on Biological Diversity, Convention on Migratory Species and its agreements, Ramsar Convention, CITES, World Heritage Convention, Bern Convention, European Landscape Convention; Alpine and Carpathian Conventions).
4. Funding nature management (GEF, LIFE, agri-environmental and climate change schemes, national subsidiary schemes/subvention programmes), science, research. monitoring, inventories/surveys, innovations and indicators, communication, education and public awareness.
5. International institutions, programmes and initiatives related to nature conservation and management (UN agencies and programmes and other inter-governmental bodies, *e.g.*, OECD, IPBES); role of international and national NGOs (*e.g.,* IUCN, WWF, Greenpeace, Conservation International, BirdLife International, Planta Europa); citizen science as a part of the post-normal science.
6. Nature conservation policy in the EU (implementation of the EU nature conservation legislation; other EU environmental laws; Common Agricultural Policy; Common Fishery Policy).
7. Nature conservation at the international level (UN Sustainable Development Goals; CBD Strategic Plan and its Aichi targets 2011-2020; pan-European and EU Biodiversity Conservation Strategy; EU Sustainable Development Strategy).
8. Economics and conservation policy – environmental v. ecological economics; ecosystem service; integrated ecosystem assessment; natural capital and its accounting; payments for ecosystem services; green and circular economy concepts.

**Literature**

Moodle – course Conservation Policy