**ENMPG21: Biodiversity and Ecosystem Services 2020**

**Coordinator: Prof. Nils Bunnefeld (NB)**

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**Course timetable: Wednesdays 9.00-12.00 (Room 3A142)**

**Module Aim**

Biodiversity and Ecosystem services focuses on biodiversity and the role it plays in the dynamics of ecosystems, the drivers of these dynamics and the services ecosystems provide. There is an increasing realisation that the interaction between people and the environment is driven by feedback loops and interdependencies. With the growing impact and dependency of humans on the environment it is essential to acquire knowledge and skills on the concepts and techniques necessary for the monitoring, analysis, management and conservation of biodiversity and ecosystems under pressure to halt the loss of biodiversity and to ensure human livelihoods and wellbeing. This module will equip students with the skills necessary for monitoring, analysis and conservation of biodiversity, ecosystems and its services.

**Acquired Skills and course content**

The module proceeds from conceptual underpinnings to practical applications, and investigate the effectiveness of varied conservation practices.

The module will provide opportunities for students to develop the following specific areas of knowledge:

* To understand the nature of biodiversity, its spatial and temporal patterns, and the need for its conservation
* To demonstrate the principles of conservation biology and their application to the management of biodiversity
* To examine the actions being taken by both governmental and non-governmental organisations to conserve biodiversity
* To gain an appreciation of biodiversity conservation through a field visit.
* To understand ecosystems and ecosystem services and what regulates them
* To evaluate the feedback loops between ecosystems, ecosystem services and human wellbeing
* To be able to assess and develop policies, management strategies and tools for decision making in ecosystem management and conservation for the benefit of biodiversity and the services it provides to humans

**Teaching programme**

Over the course of 11 taught weeks, there will be one introductory session, nine three-hour sessions that cover the underlying theory and knowledge of ecosystem services followed by a discussion session or case study. In addition, there will be a field visit to a European beaver enclosure to learn about species reintroductions.

**Timetable**

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| **Session** | **Topic** | **Lecturer** |
| 15Jan | Introduction to the module | NB |
| 22 Jan | Biodiversity – trends, drivers, why we should care | KP |
| 29 Jan | Species-based conservation | KP |
| 5 Feb | Area-based conservation; protected areas, restoration, rewilding | KP |
| 12 Feb | Conservation for the future + Q&A session for grant application assignment | KP |
| 4 Mar | Biodiversity and ecosystem services I | NB |
| 11 Mar | Biodiversity and ecosystem services II | NB |
| 18 Mar | Trade-offs and conflicts in biodiversity conservation + grant reviewing session | NB/IH |
| 25 March | ES and conservation decision making: simulation modeling I | JM |
| 1 April | ES and conservation decision making: simulation modeling II | JM |
| 15 April (TBC) | Field visit | KP/NW |

**Course Assessment**

POSTnote 30%; Grant application 30%, essay 40%

The course will be assessed on three coursework exercises. Written coursework will be screened using the University’s plagiarism software – you will need to submit an electronic copy via Canvas.

***1. POSTnote***

The aim of Parliamentary Office of Science and Technology (POST) is to inform parliamentary debate by providing independent, balanced and accessible analysis of public policy issues related to science and technology. One of the ways in which it does this is to produce short briefing notes (POSTnotes) relating to current science and technology issues. POSTnotes are written by one of six science advisers who generally have a postgraduate qualification and science policy experience. In addition to permanent staff, fellowships are awarded competitively to PhD students through scientific societies and research councils, who then spend three months at POST gaining experience in science policy and parliamentary procedures. All reports and POSTnotes are externally peer reviewed, and scrutinised by the Board before publication.

The purpose of this exercise is to produce a short POSTnote which will provide a clear and balanced outline of the issues and relevant scientific evidence. The topics offered below have been chosen on the basis that they has not already been covered by a POSTnote but is a current, and hotly debated, issue in conservation and wildlife management in Europe today. You will receive marks by showing your ability to search and use multiple literature sources and databases, interpret information from a wide variety of sources, structure your case in a coherent and logical manner, and presentation. It is important to note that a POSTnote is not just a short essay formatted in two columns – be imaginative in the limited space you have to maximise the information you can deliver. Your POSTnote should be aimed at an educated audience but with clear explanations of any scientific jargon used. References should be clearly listed and wherever possible use primary literature sources (i.e. journals) and reports, NOT website addresses (references to online databases are okay). Below is the URL to the parliamentary web site and a specific POSTnote on invasive species. You should use the same broad format as that used for the real thing (i.e. a header at the top and two column format), but the rest is up to you.

POST website: <http://www.parliament.uk/post>

Example POSTnote on invasive alien plant species:

<http://researchbriefings.parliament.uk/ResearchBriefing/Summary/POST-PN-439/>

Choose one topic from the list below:

1. The contribution of species reintroductions for biodiversity conservation
2. The role of agri-environment schemes in conserving wildlife
3. The potential for the use of *assisted migration1* to help mitigate the effects of climate change 1 also known as assisted colonisation / translocation.
4. The evidence for and against the use of trophy hunting in conservation.

Deadline for submission 11th February (14.00). The POSTnote is strictly limited to 2 sides of A4 which is approximately 1,500 words (this does not include references which may be submitted on a separate page).

***2. Grant Application***

The grant application follows the format of the Rufford Small Grants and needs to address the questions in the section “Current application questions for Rufford Small Grants”(<https://apply.ruffordsmallgrants.org/help/questions>). We will provide an amended version of this as a template. This assessment builds on the module material relating to the conservation of biodiversity. Using a project and case study of your choice you need to demonstrate and critically assess the background to this project, what a project would do (activities), the methods, conservation benefits, who will be involved and the funding you need.

In this exercise, we will also be introducing you to the concept of peer review, which is an integral aspect of academic research to assess work submitted for publication and grant applications. You will receive feedback on a draft of your grant from one of your peers, and have the opportunity to amend your application before the final submission.

Key points for this assignment:

* Your application will be for a 1st Rufford Small Grant (maximum funding available £6,000).
* You must ensure your application meets their eligibility criteria: <https://apply.ruffordsmallgrants.org/help/criteria>.
* You need to submit your application using the template provided under: Units > Assessment.
* An example of a previously successful Rufford Small Grant is provided under: Units > Assessment (the application form has changed over time so some questions may differ from those in your template).
* 10% of your grade for this assignment will be based on the quality of your assessment on one of your peer’s draft applications. You may find this article on writing useful reviews helpful: <https://mrc.ukri.org/news/blog/8-top-tips-for-writing-a-useful-review/>
* Because of the timeline required for peer review, it is not possible to provide extensions for the draft application or the peer review parts of this assignment.

Key dates for this assignment:

* 12th February: we will run a Q&A session on writing a grant application within the scheduled teaching session.
* 13th March (14.00): Submission of draft grant application submission
* 18th March: we will provide guidance for conducting peer reviews within the scheduled teaching session.
* 20th March (14.00): Submission of peer review
* 24th March (14.00): Submission of final application

***3. Essay***

The essay of a maximum of 2000 words (excluding references) critically evaluates

* the link between a specific ecosystem with its specific biodiversity and how it maps onto Mace’s ecosystem services framework published in 2012 in Trends in Ecology & Evolution (<http://www.sciencedirect.com/science/article/pii/S0169534711002424>).
* the ecosystem functions and what services it provides
* the usefulness of these frameworks for assessing and managing ecosystem services for biodiversity conservation and people's wellbeing. Please use an ecosystem of your choice or use one that we will discuss in one of the sessions.

Deadline for submission: 16th April (14.00).

**Reading list**

It is expected that students will familiarise themselves with the primary scientific literature. This will be facilitated during the course with ample reference to original research articles published in peer-reviewed scientific journals, which will be discussed during lectures. References and PDFs of papers will be made available on Succeed.

There is no core textbook for this course since you will be largely using journal articles in the scientific literature. However, it can be useful to use text books to provide a broad overview of topics - below are some books you may find useful for the course and other sources of information. The library has copies of all of these (plus other books relevant to this subject area – just because something is not listed below does not mean it’s not useful). You may also want to see if you can buy second hand / older edition copies which will be much cheaper than new editions – whilst these obviously will not be as up to date, the structure and large parts of content often don’t change substantially.

Since it is not possible in class to go into depth on the large number of issues raised during this course, it is extremely important that you follow up on topics covered by reading books and journals. If you have not taken a class in the conservation/biodiversity previously, we recommend that you read an introductory chapter from one of the books below on what the term “biodiversity” means and what the key drivers of change are (e.g. Chapters 1 and 5 from *Biodiversity: an Introduction* – this is available as an ebook through the library*).*

If you are interested in a particular subject area, use Web of Science, Scopus or Google Scholar (www.scholar.google.co.uk) to see what has been published on a particular topic. Even if it the library doesn’t have the journal you will still be able to read the abstract. Searching using the “Cited Ref Search” in WOS allows you to access any paper that has cited a paper since its publication. Be aware that there may be disagreements between scientists on particular theories and methodologies – sometimes a journal will print a criticism of a previously published paper and then allow the original authors to respond to this. These can be a useful way of finding out what the arguments are surrounding a particular issue.

*Recommended books and journals*

Bunnefeld, N., Nicholson, E., Milner-Gulland, E.J. 2017. *Decision-making in conservation and natural resource management: models for interdisciplinary approaches.* Cambridge University Press.

Caughley, G. & Gunn, A. 1996. *Conservation Biology in Theory and Practice*. Blackwell Science, Malden, Massachusetts, USA.

Gaston, K.J. & Spicer, J.I. 2004. *Biodiversity: An Introduction*. Blackwell Science. Available as an ebook through the library.

Groom M.J. et al. 2006. *Principles of Conservation Biology*. 3rd edition. Sinauer Associates.

Hunter, M.L. & Gibbs J.P. 2006. *Fundamentals of Conservation Biology.* Blackwell Science.

Mace, G.M., Norris, K., Fitter, A.H. (2012) Biodiversity and ecosystem services: a multi-layered relationship. Trends in Ecology and Evolution, 27: 19-26

Primack, R.B. 1993. *Essentials of Conservation Biology*. Sinauer Associates.

Sinclair, R.E., Fryxell, J.M. & Caughley, G. 2006. *Wildlife Ecology, Conservation & Management*. 2nd edition. Blackwell Publishing.

Sutherland, W.J. 1998. *Conservation Science and Action.* Blackwell Science.

Sutherland, W.J. 2000. *The Conservation Handbook.* Blackwell Science.

Wilson, E.O. 1988. *Biodiversity*. National Academy Press.

Redpath, Guitierrez, Wood, Young 2015*. Conflicts in Conservation*. Cambridge University Press

Sander, Dendoncker, Keune 2014. *Ecosystem Services: Global issues, local practices*. Elsevier Science.

*Science journals*

The library has paper copies or online copies from a large number of journals, which publish papers on issues relating to biodiversity and ecosystem services. There are journals specifically relating to ecosystem services, conservation and wider ecological issues. All the journals listed below are either open access or we have online access via the library – how far back this goes varies between journals but the library also has hard copies of many of the older editions. Some of these are listed here but there are many others: Biodiversity & Conservation, Biological Conservation, Conservation Biology, Ecology and Society is an open access journal (<http://www.ecologyandsociety.org/>), Journal of Applied Ecology, Nature, Science, Trends in Ecology and Evolution (a good review journal), Ecosystem Services.