



Studieplan 2009/2010

Master i anvendt økologi

Studiepoeng: Arbeidsmengde i studiepoeng er: 120.

Studiets varighet, omfang og nivå

The length, extend and level of the study:

The master in applied ecology is a full time study over 2 years, consisting of 120 ECTS credits according to § 3 in 'The regulation of requirement to a master degree appointed by the Ministry of Education and Research July 2nd, 2002 ("Forskrift om krav til mastergrad" fastsatt av Utdannings- og Forskningsdepartementet den 2. juli 2002). Half of the study (60 credits) consists of a master thesis in applied ecology.

Innledning

Introduction:

1.1 Background

Through evolutionary time species have gone extinct, sometimes in the form of mass extinctions. The background or 'natural' extinction rate is, however, negligible compared to the impact of man on species survival. The extinction of species today is estimated to be 100-1 000 times higher than the background extinction rate, estimated as the average extinction rate over the last 100 million years. There is good evidence that we are now approaching another mass extinction which would be solely due to human activity and surpass in extent any previous mass extinction.

Of the 13 million species assumed to be present in the world today, only 1.8 million have been scientifically described and named. The eradication of species, even before they have ever been described, is one of the major environmental threats today. In Norway alone, ca 15 000 species have been assessed as threatened, and as many as 3 000 species exist in the national 'red list' of species most vulnerable to extinction. Among the larger, most conspicuous species in Norway, 30 and 25 % of all mammals and birds, respectively, belong to the red list.

Extinction of species reduces biodiversity and its inherent value. More concretely the instrumental, or utilitarian, value of biodiversity is reduced by decreasing humans' possibilities to acquire goods (e.g. food, fuel, fibre and medicines), services (e.g. pollination, recycling, nitrogen fixation, homeostatic regulation), information (e.g. genetic engineering, pure science) and psycho-spiritual values (aesthetic beauty, religious awe, scientific knowledge).



The extinction of species also contravenes human intentions for sustainable development as agreed in international conventions. Even though the understanding of extinction of species is highly dependent on evolutionary and ecological processes, there is a need today to incorporate such knowledge with an understanding of human impacts on ecosystems. In the present program we will focus on the biological processes and the scientific tools needed to understand and acquire knowledge about sustainable development of ecosystems, aiming to provide the competence needed among the many practitioners in the professional areas of education, management and research who will influence the sustainable development of our future.

1.2 Applied ecology

Ecology is the scientific study of the interactions that determine the distribution and abundance of organisms. The 'applied' perspective often refers to how ecological knowledge can be used to achieve specific aims. The aims may be associated with the exploitation of natural resources, for instance as a sustainable harvest, or equally with the protection of the biodiversity of ecosystems. Human impacts such as habitat destruction and fragmentation, harvesting, biological control, the introduction of alien species, and discharge of environmental poisons or climatic gasses all contribute to changes in the environment. Today these changes are occurring at a much faster rate and to a greater extent than species are able to adapt to. However, ecological knowledge may be used to reduce the detrimental effects. For instance, remedial actions such as specific harvesting strategies or a landscape approach to areas of expansion may allow sustainable development between man and the environment. Sustainable development does, however, demand specific methods for monitoring the natural environment to identify deviations from the aims of management. Hence, in the present master program in applied ecology we focus on:

- 1) The ecological effects of human impact in nature;
- 2) The ecological effects of remedial actions;
- 3) Sustainable utilisation of natural resources; and
- 4) Wildlife- and habitat monitoring.

'Applied' in the present study program also refers to the ability to carry to completion a substantial piece of original research. We aim to train students to be able to plan, conduct, analyse and present results from ecological studies with management applications. Besides a strong foundation in the discipline of ecology, this requires knowledge of novel technology, mathematical and statistical skills, as well as a good command of English which is the scientific language. We will attach importance to the students' ability to acquire information and be critical of the sources referred to. Seminars and discussions will enhance students' abilities to evaluate 'accepted truths in ecology', and results and interpretations from other studies.

Despite the discipline of ecology being neutral in value, several topics in ecology touch on areas of conflicting values. Knowledge of the development of human ethical principles and attitudes is



important to be able to communicate with various social groups that need ecological results. Hence, to complete the ‘applied’ perspective, a knowledge of social sciences as well as the development of communication skills, will run like a connecting thread throughout the study.

1.3 Why a master in applied ecology

International conventions require a continuously higher level of consciousness regarding the use of natural resources and wildlife- and habitat monitoring. Norway, and the Nordic countries in general, hold a unique position in this context with large, relatively intact, wildlife areas which we have a special responsibility to utilise sustainably. As far as we know, we are the first educational institution in Norway, and among the Nordic countries, to prepare a master of science degree in applied ecology. Except for the University of Stavanger, all the universities in Norway either offer a master of science in ecology, or offer ecology as a major area of study within a master of science in biology. Characteristic of the master of science in ecology offered in Norway, is the focus on ecology as a basic science.

The master of science in applied ecology is also unique in Norway because it is proposed to be taught in English to give it an international perspective, and because theory and practice will follow each other continuously during the study.. The emphasis of the research program will be on empirical research addressing questions relevant to regional wildlife management.

Læringsutbytte

Aim of the study:

The Faculty of Forestry and Wildlife Management aims to offer studies related to the sustainable utilisation of forest and unenclosed hinterland within an institutional area of commitment called ‘Green values’. With Green values we highlight the significance of nature, not only as an economic resource, but also for the well-being of humanity and the inherent value of biodiversity. It is the faculty’s objective to be actively involved in research programs addressing the application of ecological science and to increase internationalisation through student exchange programs, an increased number and improved level of courses taught in English and cooperative research programs with international institutions.

The Master of science in applied ecology aims to provide the opportunity for students to:

- Learn to conceive, plan and carry to completion a substantial piece of original research under the supervision of a professional in the field;
- Become familiar with contemporary knowledge and thinking in the field of applied ecology;
- Learn to communicate and participate in discussions on current controversial issues in ecology and the application of the science .
- Acquire in depth knowledge of:
 - Ecological topics at scales from individuals to global systems.
 - Human impacts due to harvesting, introduction of alien species, habitat destruction and fragmentation, population control, pollution and climatic changes.
 - The application of ecological methodology such as study design, statistical modelling, ecological technologies and analysis of wildlife and habitat monitoring.



Målgruppe

Target group:

Our aim is to target students and professionals who have a dedicated interest in wildlife, and the interaction between man and the environment. Herein we target professionals within wildlife management who want to extend their competence in the field of ecology above the level of a bachelor.

Primarily we target students with a bachelor in ecology, (wildlife) biology, evolution, environmental sciences or such like. However, we encourage applicants with other bachelor degrees, or who can show an interdisciplinary bachelor degree, as long as they fulfil the entrance requirements (see chapter

Kompetanse

Career:

The masters degree in applied ecology qualifies the student to:

- 1) Work as a research assistant, for instance with environmental impact assessment or wildlife- and habitat monitoring;
- 2) Work in decision making in private and public wildlife management at all levels from licensees, local authorities and ministries.
- 3) Work at educational institutions. Additional pedagogic background may be needed dependent on institutional requirements.
- 4) Enter a PhD-program in ecology, biology or likewise for a further career in research.

Opptakskrav fritekst

To enter the programme, a student is required to confirm the achievement of: 1. A Norwegian bachelor degree, or an education recognized as being equivalent to a Norwegian bachelor degree ;and 2. At least 80 ECTS credits in the major area of study, that is: at least 70 ECTS credits in ecology, (wildlife) biology, evolution, environmental sciences, zoology, botany or such like, and 10 ECTS credits in statistics or similar courses in scientific methods;and 3. English language requirements

Undervisnings- og læringsformer

Teaching structure:

Lectures followed by practical exercises both in the field and in the computer-lab. There will also be extensive use of seminars by student presentations and discussions as well as presentations by invited external professionals. See chapter 12 for a detailed description.

Vurderingsformer

Evaluation:



See description of courses below.

Internasjonalisering

Internationalisation:

We propose the master in applied ecology to be taught in English. This to allow for international applicants, and to create an international student environment that will improve the quality of the study, not least through discussions of various 'schools' in ecology and human attitudes. We will encourage and make allowances for students who wish to study abroad for part of their degree. Such an international stay is recommended to take place during the second and/or third semester of the study depending on the courses the student may achieve abroad. In addition, we will accept qualified external supervisors of the master thesis from international universities and university colleges. Hence, an international stay may be used to carry out part of the master thesis.

Hedmark University College has several international agreements of collaboration. Specific to the Faculty of Forestry and Wildlife Management there are active student exchange programs with:

- University of Applied Sciences, Eberswalde, Germany
- Arnt-Moritz-University Greifswald, Germany
- University of Applied Sciences, Weihenstephan, Germany
- University of Freiburg, Germany
- School of Forestry, Basna Stiavnica, Slovakia
- Zvolen University, Slovakia
- Pacific Lutheran University, USA
- North Dakota State University, USA

The faculty also has student- and staff exchanges with the University of Fairbanks, Alaska, and African Wildlife Management College, Tanzania, and an agreement of intention with 12 Nordic institutions to cooperate on joint degrees in 'Nordic Ecosystem Management'.

Studiets innhold, oppbygging og organisering

Content, structure and organisation of the study:

First semester: The basics of applied ecology and ecological scientific methodology, including the ability to gain knowledge from information technology.

Second semester: Discussing current topics in applied ecology, and doing the optional courses as for instance methodological courses with the intention of achieving competence in advanced monitoring technology.

Third semester: Same as the second semester, but with more emphasis on data collection for the master thesis.



Fourth semester: Analysing and completing the master thesis.

The recommended progress of the master in applied ecology:

First Semester	6SU 321 (10 credits) Study design and statistical modelling	6SU 311 (20 credits) Human impact in ecology and evolution
Second Semester	6SU 312 (10 credits) Optional (10 credits) Current topics in applied ecology	6SU 399 Master thesis (60 credits)
Third Semester	6SU 360 (10 credits) Human dimensions in ecosystem management	
Fourth Semester		

8.1 The first semester

The first semester will introduce the student to advanced topics in the science of ecology and applied scientific methodology through two courses:

- 1) 6SU 311 (20 credits): *Human impact in ecology and evolution*
- 2) 6SU 321 (10 credits): *Study design and statistical modelling*

These two courses will be integrated such that topics covered in 6SU 311 are followed by exercises and writing of reports in 6SU 321. Hence, the first semester will introduce the student to the writing of the scientific 'story', while seminars in 6SU 311 will introduce the student to oral presentations, scientific publications and discussion.

8.2 The second and third semester

The basic knowledge acquired during the first semester will be developed here with seminars by the



students themselves on current topics in applied ecology (6SU 312). In these seminars students will present and discuss recent international publications within one of the four fields we are focusing on: human impacts, remedial actions, sustainable use and monitoring. As a follow up to 6SU 321, the discussions will also focus on the study design and analysis presented in the paper. The course will run throughout one whole year allowing the students to mature in the discussions in current topics in applied ecology, and to include monitoring techniques in various seasons.

In addition the students are offered the possibility to choose various intensive courses in monitoring methodology (6SU323, 6SU324, 6SU35, 36SU326). While the seminars in current topics in applied ecology focus on oral presentations and communication skills, the monitoring course focus on the skills of analysing and writing through exercises. Both 6SU 312 and 322

8.3 The fourth semester

Students will use all their time to complete the master thesis, including data analysis and writing. We will, however, encourage our fourth semester students to follow the seminars in current topics in ecology and thus contribute to the discussions as they become senior masters in applied ecology.



Master i anvendt økologi

Emner

Studiepoeng År 1 År 2

- [Study design and statistical modelling](#)
10 studiepoeng
- [Human impact in ecology and evolution](#)
20 studiepoeng
- [Optional](#) (optional)
10 studiepoeng
- [Current topics in applied ecology](#)
10 studiepoeng
- [Human dimension in ecosystem management](#)
10 studiepoeng
- [Master thesis in applied ecology](#)
60 studiepoeng



Emneoversikt

6SU321 Study design and statistical modelling

Emnekode: 6SU321

Studiepoeng: 10

Språk

Engelsk

Forkunnskaper

Læringsutbytte

To learn the relationship between the scientific question, choice of study design, analyses and the presentation and interpretation of results.

Innhold

The course will start with basic statistics, but quickly progress to advanced statistical modelling and the association between statistical modelling and study design. Example of topics: Basic statistical terminology such as population, sample, independence, various types of variables, statistical and biological significance, degrees of freedom, and statistical distributions; Basic descriptive and exploratory statistics; The applicability of statistical modelling with topics such as: Selection of the most parsimonious model through various procedures, AIC, Cp, average modelling, Bayesian modelling, and common sense; Generalised linear mixed models with various link functions and error distributions; Multivariate analysis; From statistical to predictive mathematical models.

Organisering og arbeidsformer

Taught in English. Lectures and exercises in the computer-lab. Exercises in combination with 6SU 321 that result in individual written reports. .

Vurderingsordning

Three individual reports in combination with 6SU 311. Each report will receive two separate evaluations, where 6SU 321 will evaluate the statistics, structure of the report and presentation of results. The scientific content of the three reports count for 45% of the evaluation (15% for each report) and an oral exam counts 55%. Grading according to ECTS-system on scale A – E for passed, and F for failed.

Ansvarlig avdeling



Avdeling for skog- og utmarksfag



6SU311 Human impact in ecology and evolution

Emnekode: 6SU311

Studiepoeng: 20

Språk

Engelsk

Forkunnskaper

Læringsutbytte

Acquire in depth knowledge in population biology and human impacts on ecosystems and in evolution.

Innhold

Main emphasis will be given to the theory of population biology and the human impact on populations through habitat destruction and fragmentation, harvesting, introduction of alien species, population control and pollution. The course will also integrate topics on man's impact on individuals through animal behaviour (e.g. mating systems, dispersal and migrations, habitat selection and colonisation) and community dynamics (e.g. biodiversity and global issues such as climatic changes).

Organisering og arbeidsformer

Lectures, seminars and exercises. Some exercises will be given in combination with 6SU 321 and result in written reports. Seminars will include presentations and discussions by student groups

Vurderingsordning

- 1) 50 % Portfolio
- 2) 50 % Oral exam

Grading according to ECTS-system on scale A-E for passed, and F for failed.

Ansvarlig avdeling

Avdeling for skog- og utmarksfag



Optional

Emnekode:

Studiepoeng: 10

Språk

Engelsk

Forkunnskaper

Læringsutbytte

See the specific topic

Innhold

See the specific topic

Organisering og arbeidsformer

See the specific topic

Vurderingsordning

See the specific topic

Ansvarlig avdeling

Avdeling for skog- og utmarksfag



6SU312 Current topics in applied ecology

Emnekode: 6SU312

Studiepoeng: 10

Språk

Engelsk

Forkunnskaper

6SU311

Læringsutbytte

Inform and update students in current topics in applied ecology, and enable students to criticise prestigious publications objectively.

Innhold

Recent international publications in the four topics of applied ecology:

- 1) The ecological effects of human impact in nature;
- 2) The ecological effects of remedial actions;
- 3) Sustainable utilisation of natural resources;
- 4) Wildlife and habitat monitoring.

Organisering og arbeidsformer

A weekly meeting point between the scientific staff and students. Each seminar is organised under the supervision of the responsible teacher by a group of students presenting a recent publication in applied ecology which they will critically evaluate as if they were referees. Some seminars are carried out by invited lecturers.

Vurderingsordning

Each presentation will be assessed & will contribute 10% towards the final grade.

Evaluation will be based on showing a good understanding of the material and an ability to communicate the main points of the paper by giving a clear and well structured synthesis which should include the objectives of the study, a clear description of the methods / study design & explanation of



the main results together with a critical evaluation of the material, including ways the study could have been improved, whether sampling has been adequate, whether appropriate statistical methods were used, and whether the conclusions are adequately supported.

Ansvarlig avdeling

Avdeling for skog- og utmarksfag



6SU360 Human dimension in ecosystem management

Emnekode: 6SU360

Studiepoeng: 10

Språk

Engelsk

Forkunnskaper

Læringsutbytte

Introduce the student to general theories and methods of social sciences applicable in wildlife management.

Innhold

A basis for understanding the human dimension of natural resource management, and provide: An overall understanding of the multidisciplinary aspects of applied ecology in general, and the social scientific aspects of ecosystem management in particular; Appreciation of social, cultural and economic values of ecosystems; Insights into the conflicts in ecosystem management: their source and solutions; Insight of major social scientific disciplines and their approach to ecosystem management; Case studies and examples of the use of HD research and approaches to ecosystem management.

Organisering og arbeidsformer

Taught in English. Lectures, seminars, readings and discussions.

Vurderingsordning

A written exam. Grading according to ECTS-system on scale A – E for passed, and F for failed.

Ansvarlig avdeling

Avdeling for skog- og utmarksfag



6SU399 Master thesis in applied ecology

Emnekode: 6SU399

Studiepoeng: 60

Språk

Engelsk

Forkunnskaper

6SU 311, 6SU 312, 6SU 321, 6SU 322, or similar.

Læringsutbytte

An independent research project, where the student will plan, design and collect data from an empirical study connected to applied ecology, and analyse and present the results in the master thesis. The thesis will be in the form and structure of a manuscript intended to be submitted to an international scientific journal, but may be written in Norwegian.

Innhold

Optional English scientific literature accepted by the supervisor of the master thesis.

Organisering og arbeidsformer

Independent work by the student under the supervision of a professional in the field.

Vurderingsordning

Oral exam. Grading according to ECTS-system on scale A – E for passed, and F for failed.

Ansvarlig avdeling

Avdeling for skog- og utmarksfag