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What a graduate should know:  
**Survey Skills**

## INTRODUCTION

The Institute of Ecology and Environmental Management (IEEM) was founded in 1991 to boost professional status to the rapidly growing number of ecologists and environmental managers across a broad spectrum of work in the public, voluntary and private sectors. The Institute now has over 2600 members, drawn from local authorities, government agencies, industry, environmental consultancy, teaching, research, and NGOs.

IEEM aims to establish, maintain and enhance professional standards within the industry and also to raise the profile of the profession in general.

The Institute has invested considerable effort on how best it can promote the education of future ecologists and environmental managers. It recognises the central role that universities and degree programmes have to play in this process.

There is a very large number of undergraduate courses available to an applicant considering moving in to this area of work. These courses will have been designed with different endpoints in mind and consequently the course taken may have a major influence on the skills and knowledge a graduate will have.

In recent years it has become apparent that there is a shortage of people entering the profession with appropriate field skills. The following guidance has therefore been written so that anyone applying to university will know the level of field survey skills expected of a new graduate.

Those people wishing to explore a career in Ecology or Environmental Management should use this guidance to assist in selecting courses to apply for. By comparing course curricula with the information in this document, it should be possible to see which courses will provide graduates with the suitable level training in relevant field survey skills.

This guidance may also be used by course providers when developing new courses or when updating existing courses.

This guidance document was written by the IEEM Training, Education and Career Development Committee, 2007.

## PLANNING FOR SURVEY/MONITORING



By graduation a student completing a course in an ecological discipline should be able to:

### SURVEY STRATEGY

- Justify the importance of setting clear objectives as the first stage of any survey/monitoring exercise.
- Define objectives for a set task.
- Design measurable questions to allow objectives to be tested.
- Design a survey methodology to test simple objectives.
- Estimate time required including travel and setup times.
- Identify equipment needs.
- Design an appropriate monitoring strategy in terms of quality and replicability of results.
- Record the survey methods in sufficient detail to allow someone else to repeat the work.

### HEALTH AND SAFETY – RISK ASSESSMENT

- Complete a risk assessment for field-based work.
- Know how to critically assess field conditions and adapt survey work accordingly (a dynamic risk assessment will affect equipment or indeed ability to survey).
- Produce a risk assessment that complies with good practice for all but unusually dangerous field work.
- Select appropriate personal protective equipment for different types of surveys.

### ACCESS

- Interpret, in relation to survey work, the legislation governing access to land in the UK.

### INTERPRETATION OF RESULTS

- Interpret the results of the surveys and/or monitoring exercise for a wider audience.



## FLORA IDENTIFICATION AND SURVEY



By graduation a student completing a course in an ecological discipline should be able to:

### TAXONOMIC THEORY

- Describe the main levels of the taxonomic hierarchy and know the endings of names of each level.
- List the major taxa of plants and recount the distinguishing features for separating these taxa.
- Identify the components of a species name and the meaning of each part of that name.
- Understand the principles of, need for, and use of, a systematic approach to taxonomy.
- Locate the main sources of advice and expertise.

### FLORA IDENTIFICATION

- Describe the morphology of plants using the standard botanical terminology (e.g. as used in Stace, C. 1991. *New Flora of the British Isles*. Cambridge University Press, Cambridge).
- Describe the main types of keys (i.e. dichotomous, multi access) that are used to assist in the identification of plant species.
- Use a key to identify an unknown plant species from a range of terrestrial and aquatic habitats.
- Critically assess the strengths and weaknesses of the different types of keys.

### SURVEY TECHNIQUES

#### Habitat Mapping

- Describe the main systems for mapping habitat types (Phase 1 habitat survey and/or broad habitats) and identify the main groupings of habitats within these.
- Accurately identify the more common habitat types as defined in one of the above systems.
- Undertake a habitat survey of mixed agricultural/woodland area using either the Phase 1 Habitat Survey or the Biodiversity Broad Habitat Classification.

#### Phase 1 Habitat Survey

- Describe the three coding systems used to represent habitat types.
- Use target notes appropriately.
- Critically assess the effectiveness of the habitat mapping as a tool for use in nature conservation evaluation, site management, impact assessment and research.

#### National Vegetation Classification (NVC)

- Critically assess the effectiveness of the NVC as a tool for use in nature conservation evaluation, site management, impact assessment and research.
- Describe the survey necessary to identify the NVC communities in an area of vegetation.
- Convert survey data into the appropriate form for comparison with the NVC tables.
- Describe the structure of the NVC tables and the three major groupings within it.
- Describe the approaches to identifying NVC communities based on quadrat data and critically assess the strengths and weaknesses of each approach.
- Map plant communities on a site containing moderately simple communities or sub communities.

#### General Survey

- Design and implement a survey to record vegetation structure.
- Describe the measures used to record plant abundance and the situations where each is appropriate.
- Describe the strategies available for sampling vegetation and determine the most appropriate strategy for a given survey scenario.
- Design a vegetation monitoring strategy for a simple site where the objectives of the monitoring are clearly set.
- Demonstrate knowledge of other types of plant surveys for both higher and lower plants.

## FAUNA IDENTIFICATION AND SURVEY



By graduation a student completing a course in an ecological discipline should be able to:

### TAXONOMIC THEORY

- Describe the main levels of the taxonomic hierarchy and be aware of the endings of names of each level.
- List the major taxa of fauna and recount the distinguishing features for separating these taxa.
- Identify the components of a species name and the meaning of each part of that name.
- Understand the principles of, need for, and use of, a systematic approach to taxonomy.
- Locate the main sources of advice and expertise.

### FAUNA IDENTIFICATION

- Describe the identifying features of each of the groups of fauna using appropriate terminology.
- Describe the main types of keys (i.e. dichotomous, multi access) that are used to assist in the identification of faunal species.
- Use a key (where appropriate) to identify an unknown faunal species.
- Critically assess the strengths and weaknesses of the different types of keys.
- Describe the types of evidence that can be used to identify species using a site, either directly (e.g. by appearance) or indirectly (e.g. by calls or feeding signs).
- Discuss the strengths and weaknesses of the direct and indirect approaches and the situations where they should be used.

### SURVEY TECHNIQUES

#### Species Mapping

- Design a strategy for mapping the territories of faunal species (particularly birds and selected mammals) in an area.

#### General Survey

- Select the appropriate survey technique for a given faunal group in a specified habitat type. The groups covered will include birds, mammals, reptiles, amphibians and invertebrates. For the purposes of survey methods, these groups will normally be further sub-divided to determine the appropriate technique, either by spatial use of the habitat (e.g. benthic freshwater invertebrates) or by taxonomic group (e.g. badger, otter).
- Understand the importance of season and weather conditions to survey and use this information in the planning of survey.
- Critically assess the effectiveness of the survey techniques as tools for use in nature conservation evaluation, site management and research.
- Design a survey to record faunal communities on a site.
- Design a faunal monitoring strategy for a simple site where the objectives of the monitoring are clearly set.
- Demonstrate knowledge of other types of surveys e.g. for plants and how they link to provide a broader view of the ecology of that environment.

#### Legal/Ethical Issues

- Describe the legal protection afforded to fauna and discuss its implications for survey and monitoring.
- Identify those species for which a licence is required before they can be surveyed.
- Describe how such licences can be obtained and the conditions that normally apply for survey under such licences.
- Demonstrate knowledge of ethical issues associated with faunal survey.





## DATA ANALYSIS, INTERPRETATION AND REPORTING

By graduation a student completing a course in an ecological discipline should be able to:

### DATA ANALYSIS

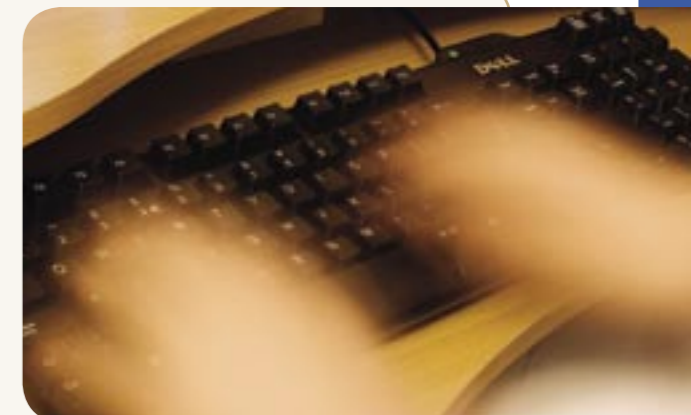
- Identify an appropriate hypothesis to test, based on the objectives of a study and the data available.
- List and describe the main methods available to statistically analyse data including parametric and non-parametric approaches.
- Describe the strengths and weaknesses of the above methods.
- Identify and justify the statistical techniques used to test a given hypothesis.
- Identify any assumptions, limitations or constraints in the analysis.
- Be able to use simple software programs for analysing data and demonstrate knowledge of more complex programs.
- Use data records objectively for both research and publication.

### DATA INTERPRETATION

- Be able to interpret data in a wider context in order to produce conclusions, judgements and recommendations e.g. published papers standards and criteria.
- Describe the relationships between two or more variables in terms of magnitude, direction and significance of any relationships found.
- Identify atypical or extreme data and know how such data may affect any conclusions drawn (*i.e.* biases).
- Use various visual techniques to examine and interpret the data such as histograms and scatter plots.
- Present clear and justified conclusions summarising the results, interpretation and recommendations.
- If the results do not support or confirm the hypothesis, provide an explanation.

### DATA COLLECTION AND STORAGE

- Record data following clearly defined methodologies.
- Discuss the importance of minimising operator bias in the collection and recording of data.
- Discuss the importance of recording factors potentially affecting the accuracy or repeatability of collected data.
- Discuss the importance of maintaining a secure archive of data collected, and of retaining original recording sheets and notebooks.
- Accurately label and record both data sheets and samples so that the basis for conclusions reached can be traced back to the original data sources.



### REPORTING

Reports should provide the reader with an account of the processes and outcomes of a study in a logical and clear manner. A report should:

- Provide an introduction and background to a study as well as setting out the objectives of the study.
- State how a hypothesis was determined.
- Explain the methodology used to test the hypothesis, including assumptions and limitations.
- Describe the results and use visual techniques wherever possible.
- Use appendices to present raw data.
- Relate the interpretation of the results to each of the objectives of the study.
- Draw conclusions, put into context and make recommendations.

## MAPPING

By graduation a student completing a course in an ecological discipline should be able to:



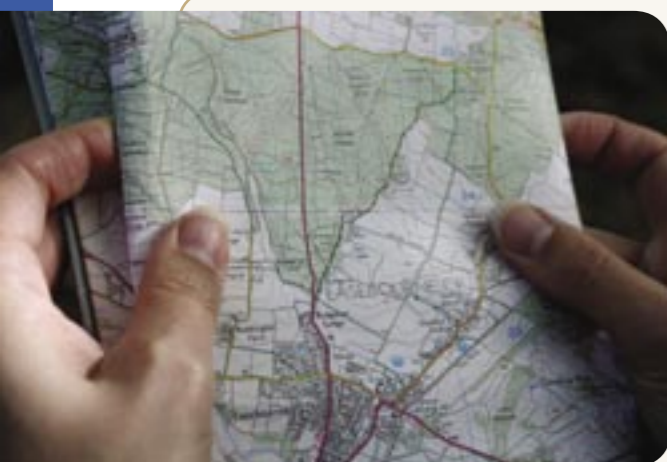
### THEORY

- Understand the features of ecology that give rise to the requirement for mapping.
- Critically assess the use of mapping as a tool in long-term ecological studies.
- Produce a sketch map of a site, including all relevant features in sufficient detail to allow another person to re-visit the location.
- Devise a system of colour and/or pattern coding with legend to separate themes within a map where a standardised colour/pattern does not exist.

### MAPPING TECHNIQUES

#### Ordnance Survey (OS) Maps

- Use an OS map to work out a full National Grid Reference for a given site to the nearest 100 metres.
- Select the appropriate map scale for use on a given ecological task.
- Describe the main broad land use types within a 1 km square using an OS map e.g. residential/agricultural/forestry.
- Annotate a map during a site visit to show features of ecological interest.
- Understand licensing and copyright issues relating to the use of OS maps.



#### Aerial Photography

- Relate an aerial photograph to a corresponding area of OS map using relevant features.
- Identify past and present situations when aerial photography has been carried out on a national scale.
- Use aerial photography to identify temporal change within habitats.
- Critically assess the use of aerial photography as a tool for mapping and describing habitats.

#### Geographic Information Systems (GIS)

- Outline how Geographical Information Systems work.
- Describe a particular situation in which GIS could be used to display ecological data.
- Critically assess the use of GIS as a tool for mapping habitats and species.

#### Global Positioning Systems (GPS)

- Understand how GPS works.
- Describe how GPS can be used for ecological fieldwork.
- Describe the limitations of using GPS.

