SCOTTISH QUALIFICATIONS AUTHORITY

# Higher National Unit Specification

## General information for centres

**Unit title:** Ecology and Ecosystems

**Unit code:** DN37 34

**Unit purpose:** This unit introduces candidates to the fundamental concepts of ecology, the abiotic features of a variety of ecosystems and the structure of their biological communities. Candidates must also design and perform an investigation of an ecological topic either in the field or in the laboratory. This unit is suitable for students who wish to proceed to Higher Education or for those seeking employment in countryside management, game keeping, or scientific organisations.

On completion of the Unit the candidate will be able to:

1. Describe key ecological principles
2. Describe factors affecting the development of selected ecosystems
3. Perform an ecological investigation

**Credit points and level:** 1 HN Credit at SCQF level: 7 (8 SCQF credit points at SCQF level 7*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

**Recommended prior knowledge and skills:** Access to this unit is at the discretion of the centre. However, it would be beneficial for candidates to have a basic understanding of biology. This may be evidenced via passes in Intermediate 2 or Higher Biology, or by a range of appropriate NC or NQ units or by prior experiential learning.

**Core skills:** There may be opportunities to gather evidence towards core skills in this Unit, although there is no automatic certification of core skills or core skills components. Opportunities exist for the development of the following core skills or their components:

- Communications (Developed and assessed as part of Scientific reporting)
- IT (Developed )
- Working with Others (Developed)

**Context for delivery:** This unit is included in the framework for HNC Applied Sciences and HND Environmental Sciences. If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

## General information for centres (cont)

**Assessment:** Outcome 1 of this unit should be assessed as a closed book assessment of one hour duration under controlled and supervised conditions. Outcome 2 should be assessed by means of a checklist and evaluation of each site. Outcome 3 should be assessed by the performance and reporting of an ecological investigation. The planning and performance of the investigation may be carried out by small groups of students, but there must be clear evidence that (a) the candidate has participated fully in each stage of performance and planning of the investigation and (b) that the presented report is entirely the work of the candidate. The report may be written or presented in another format.

# Higher National Unit specification: statement of standards

## Unit title: Ecology and Ecosystems

## Unit code: DN37 34

The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

## Outcome 1

Describe key ecological principles

### Knowledge and/or skills

- Ecological concepts: Ecosystem, habitat, ecological niche, species, population, community
- Energy flow
- Abiotic factors : edaphic, climatic, aquatic, geological
- Inter-specific and trophic relationships: production, consumption, predation, competition, symbiosis, mutualism, commensalism and parasitism.

### Evidence requirements

All the knowledge and/or skills must be covered although in item 4, only 6 out of the 8 inter-specific and trophic relationships should be assessed. Candidates will need evidence to demonstrate their skills and/or knowledge by showing that they can:

- Define ecological concepts
- Describe energy flow within food chains and food webs
- Describe abiotic factors within given ecosystems
- Define inter-specific and trophic relationships within given communities

This outcome should be assessed by a written/oral assessment of 1 hours duration. This assessment should be carried out as a closed book exercise under controlled supervised conditions. The assessment should use short answer, multiple choice or definition questions .

### Assessment guidelines

Outcomes 1 and 2 could be taught as a single entity. The concepts of ecology and ecosystem structure and function are best taught in the context of studying a range of habitat types.

## Higher National Unit specification: statement of standards (cont)

## Unit title: Ecology and Ecosystems

## Outcome 2

Describe factors affecting the development of selected ecosystems

### Knowledge and/or skills

- Ecosystems: terrestrial, aquatic
- Ecological limiting factors
- Primary succession, secondary succession, seres and plagioseres
- Factors affecting succession – natural and anthropogenic
- Principles of biogeochemical cycles – carbon, nitrogen

### Evidence requirements

The ecosystems selected for study should include at least 3 ecosystems consisting of:

- At least one terrestrial ecosystems selected from moorland, broad-leaf woodland, coniferous woodland, grassland, peat-bog, sand dunes
- At least one aquatic ecosystems selected from river/stream, lake/freshwater loch, estuary, fjord/sea-loch, sandy/rocky shore

For each ecosystem studied the following should be described:

- typical species ~~at~~of each of producer, primary consumer and secondary consumer levels
- abiotic factors(soil type, ph, aspect, temperature, rainfall, salinity, limiting factors) of the habitat that affect the development of the community, e.g. water quality, air quality, climate, soil/substratum
- location within a succession of seres; primary and secondary succession as appropriate to the habitat – Pioneers, primary colonisers, stabilisers, climax species, nitrogen fixers
- effects of human activity on the biotic and abiotic components of the ecosystem.

This assessment should be an ~~O~~open book assessment and candidates should complete a checklist and evaluate the nature conservation of each ecosystem in approx 300 words per ecosystem. The checklist should cover all items listed in the knowledge and skills.

### Assessment guidelines

It is recommended that students, where possible, select and possibly visit 3 sites using a checklist at each site to identify the items listed in the knowledge and skills.

Outcomes 1 and 2 could be taught as a single entity. The concepts of ecology and ecosystem structure and function are best taught in the context of studying a range of habitat types

## Higher National Unit specification: statement of standards (cont)

## Unit title: Ecology and Ecosystems

## Outcome 3

Perform an ecological investigation

### Knowledge and/or skills

- Planning and organising
- Safe working practices
- Recording of information
- Reporting of methods, measurements and observations
- Analysis of results
- Field or laboratory techniques appropriate to the investigation – to include sampling or measurement of biological and abiotic components of the habitat/ecosystem.
- Dichotomous keys

### Evidence requirements

The investigation and report required for the assessment of this outcome should be related to one of the ecosystems /habitats studied in Outcomes 1 and 2.

The investigation and report should be assessed on the following criteria :

- candidate should provide evidence of planning and organising the investigation
- candidates should show knowledge of safe working practices and should follow current health and safety practices.
- the report of the investigation should conform to an appropriate format and should detail the results and analysis of the findings
- descriptions must be concise and accurate (description of survey technique, description of habitat)
- discussion of field survey or laboratory investigation, aims and results should be complete and concise and should include appropriate reference to published descriptions of the same or similar habitats.

The report should be approximately 1000 words and should be completed in the candidates own time.

### Assessment guidelines

This outcome may be undertaken on an individual or group basis. Groups should be no larger than 4 students so that tasks aren't spread too thinly and each candidate should have adequate opportunity to develop and use investigative skills. Each candidate must present a report of their own work and apart from essential discussion during the planning, organising and analysing of the investigation, all work should be the candidates own.

**Risk assessment** – it is paramount that a full risk assessment is carried out for all practical activities including site visits to habitats. It is important that student planning identifies any sites they might visit unsupervised whilst performing parts of the investigation; if these are unsuitable or cannot be risk-assessed within the timescale of the investigation then students must select an alternative that can be risk-assessed and approved. No investigation should be offered or approved unless its performance can fully comply with appropriate regulations or guidelines.

## Administrative Information

**Unit code:** DN37 34

**Unit title:** Ecology and Ecosystems

**Superclass category:** RH

**Date of publication:** August 2005

**Version:** 01

**Source:** SQA



SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

# Higher National Unit specification: support notes

## Unit title: Ecology and Ecosystems

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

## Guidance on the content and context for this Unit

This unit is intended to be a mandatory or option unit in several HN courses such as HNC Applied Sciences and HND Environmental Sciences; as such it will introduce the environmental biology candidate to some fundamental concepts of ecology and ecosystem functions that will be expanded on in specialist ecology and ecosystem units, but it must also form a legitimate end point, in its own right, for candidates in other branches of applied science, biology and environmental science.

## Guidance on the delivery and assessment of this Unit

### *Opportunities for developing Core Skills*

**Outcomes 1 and 2**

These outcomes could be taught as a single entity. The concepts of ecology and ecosystem structure and function are best taught in the context of studying a range of habitat types.

The specific habitats and ecosystems listed in the knowledge /skills for outcomes 1 and 2 provide a breadth of interest and enable colleges with different habitats available in their own areas to provide a broad study for their students. The range of habitats indicated also provides opportunity for the development of sufficient investigations that the particular interests of groups of students might be more easily accommodated.

Three ecosystems from a range of terrestrial and aquatic systems should be used as the vehicle of study and for each of them a comprehensive (but concise) discussion should occur to incorporate the knowledge and skills items. The breadth of study should be sufficiently detailed so as to allow the candidate to develop knowledge and understanding of the fundamental principles that can be transferred to study of narrow ranges of ecosystems and ecological investigations.

Outcome 1 should be assessed by means of a closed book assessment of 1 hour's duration. Outcome 2 should be assessed by means of a checklist and evaluation of 3 ecosystems.

It is not intended that there should be significant overlap with specialist ecosystems units, but the study here could form a seamless transition into specialist study; similarly the investigation may provide opportunity to develop a deeper study in a specialist unit.

**Outcome 3**
The investigation may be a largely field exercise on the distribution of organisms within a defined area or correlated with particular abiotic features of the ecosystem, e.g:

- A correlation between lichens and an abiotic factor such as proximity to crevices in a wall or height above mean tide level
- A correlation of plant distribution versus soil quality (pH, water content, particle size)

- A correlation between the distributions of two species within a given area.

It could also be an essentially laboratory study relating the behaviour of organisms to a range of values in an abiotic factor, e.g:

- flushing rate in bivalves at different temperature or in different water qualities or different food item concentrations
- rate of cirral beating of barnacles versus temperature or pH
- grazing rates of gastropods under different illuminations
- chemotaxis or phototaxis in cellular or plasmodial slime moulds.

There should be an appropriate allocation of time for the investigation. It is recommended that this is not less than 8 hours for the practical part of the investigation; the planning and organising and subsequent analysis and report writing should be within the additional time that students should devote, outwith class time, to study.

No techniques are specified for outcome 3. These would be entirely related to the topic of investigation and the ecosystem being studied but they should be standard techniques within ecology or laboratory science.

This outcome is suitable for a group activity. Each members of a work group must demonstrate that they have participated satisfactorily in all aspects of the planning, organizing and performing of the investigation. Each candidate must present a report in a permanent form that is demonstrably their own work and, apart from essential discussion during the planning, organizing and performing of the investigation, is not the result of collaborative activity.

Investigation via observation and/or experiment is an essential component of all scientific disciplines; all candidates must complete the investigation for outcome 3, however there is ample scope in investigation design to enable candidates who have mobility or other physical handicaps to perform the investigation for outcome 3 in a laboratory situation. However it is paramount that candidates complete the investigation in safety whilst fulfilling the learning and assessment requirements; neither of these may be compromised to allow any candidate access to the unit.

## Open learning

This unit may be suitable for open learning, however arrangements would need to be made to accommodate the range of habitat visits necessary to satisfy the knowledge for outcomes 1 and 2. It will also be necessary to address the requirements for an investigation in outcome 3 – especially with regard to the safety of students if they're performing investigations without supervision.

If this unit is delivered by open or distance learning methods, additional planning resources may be required for candidate support, assessment and quality assurance.
A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes.

For further information and guidance, please see Assessment and Quality Assurance of Open and Distance Learning (*SQA, February 2001, publication code A1030*)

## Higher National Unit specification: support notes (cont)

**Unit title:** Ecology and Ecosystems

## Candidates with additional support needs

This Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on the SQA website www.sqa.org.uk.

## General information for candidates

## Unit title: Ecology and Ecosystems

This unit is designed to introduce you to the major concepts of ecology and ecosystems.

You will study the concepts via a range of ecosystems and habitats. It will allow you to develop some of the investigative skills that are of major importance in the scientific study of a subject.

The three outcomes of this unit are:

1. Describe key ecological principles
2. Describe factors affecting the development of selected ecosystems~~selected habitats~~
3. Perform an ecological investigation

Outcome 1 will be assessed using a written/oral assessment; it will last for 1 hour and it will take place under closed book conditions. You will not be allowed access to any materials other than those provided by the assessors.

Outcome 2 will be assessed by means of a checklist and evaluation of 3 ecosystems.

In outcome 3 you will carry out an investigation; this may be as an individual or more likely as part of a small group. You will select the investigation from a range offered to you, or if all of the criteria for safety and academic rigour can be achieved you may be allowed to propose an investigation of your own. If you have work as part of a group you must take a full part in all stages of the planning, organising and performance of the investigation; if you have work as an individual you must perform all of these tasks alone. You will submit a report of the investigation; this must be entirely your own work even where you've carried out the investigation as a member of a group.

This unit is at SCQF level 7. You will have approximately 40 hours of timetabled activity; it is expected that you will spend up to 40 more hours of private study related to this unit.