

A-LEVEL/IB ECOLOGY:

Sample programme for two/three-day visit



SCHOOL'S REQUIREMENTS

Theory taught at school, according to syllabus, may include:

- Communities and ecosystems
- Food webs, chains and interactions
- Populations
- Biodiversity
- Statistics
- Mark-release-recapture (principles and controlled experiment)
- Evolution: natural selection of favourable characteristics
- Classification
- Human impact on ecosystems
- Coppicing, succession and sustainable use of timber

Practical work offered at Wildwood in both pine plantation and coppiced sweet chestnut woodlands over two or three days (selected by school):

Day 1:

- Introduction to sampling small mammals through small mammal trapping plus explanation of fur-clipping mark-recapture technique
- Random sampling of plants on the woodland floor using quadrats and line/belt transects
- Impact of light and shade on plant distribution, diversity, leaf size, plant height etc
- Random sampling of leaf litter invertebrates

Plus, if wished:

- Lincoln Index mark-recapture study (invertebrates)
- Introduction to coppicing, succession, sustainable use of timber and importance of coppice management to wildlife
- Captive breeding schemes and the role of zoos in conservation of endangered species
- Prey-predator relationships
- Inter-specific/intra-specific competition
- Role of large herbivores in habitat management and rewilding programmes (which can include a trip to a local nature reserve to see one of our herds of Konik horses)
- Point quadrat demonstration
- Ecological statistics workshop (1hr)

Day 2/3:

- Students' own investigations using techniques taught on day 1.

WILDWOOD'S INTERPRETATION AND PLAN

Day 1:

Recap briefly

- What ecology is
- How we assess the richness of an ecosystem/habitat
- What we use to measure it – one key indicator species or several
- Importance of random sampling
- Importance of standardized methods
- Importance of standardized accurate data collection (designing data sheets)
- Collection of supporting environmental and ecological data
- Examples of methods used to sample species here and abroad and adapting sampling techniques to different species and habitats: e.g. orchids, reptiles, otters, water shrews, dormice, small mammals, great crested newts, elephants, primates, chameleons, macaws etc.
- Health and safety at Wildwood

Teach in detail as required

- Importance of randomness in sampling (using random numbers, numbered grid, spin the pencil techniques)
- Random sampling techniques:
 - Quadrats, line and belt transects (ground flora)
 - Carpet tiles (leaf litter invertebrates)
 - Wellfield small mammal traps (wood mice, field voles, common shrews)
- Lincoln Index experiment
- Prepare students to devise and plan own projects and advise on good locations
- Ecological statistics

Practicals

Quadrats:

- Compare distribution of one/two plant species (e.g. honeysuckle/bramble) in two different woodland habitats (e.g. pine and newly coppiced woodland), where light may be a significant factor
- Take random samples using 1m² quadrats (spin the pencil technique)
- Identify honeysuckle and bramble
- Count no. individual plants of each species per quadrat
- Assess % leaf cover per species per quadrat
- Estimate species dominance per quadrat (Domin scale)
- Draw diagram of species distribution per quadrat
- Data can produce plant diversity index/habitat/light if identifying other plants as well
- Assess appropriateness of random quadrats in different woodland habitats and discuss wider uses (e.g. *elephants and wildebeest in savannah/orchids on chalk grassland, etc.*).

Quadrats and Line/Belt Transects:

- Demonstrate line/belt transects using a 10m random transect, marked at 1m intervals.
- Lay 1m² quadrats either side of transect (10 samples)
- Identify honeysuckle and bramble
- Count individual plants of each species per quadrat
- Assess % leaf cover per species per quadrat
- Estimate species dominance per quadrat
- Draw diagram of species distribution per quadrat
- Can produce plant diversity index/habitat/light too if identifying all plants
- Assess appropriateness of using quadrats with transects to sample plants within different woodland habitats and describe their wider use (*e.g. chameleons and orangutans in rain forest*).

Lincoln Index:

- Mark, release recapture study based on leaf litter invertebrates (woodlice or centipedes), using sieves, trays and pooters (*use Wildwood's invert ID guides*)
- Sample pre-prepared randomly distributed carpet refugia on woodland floor within 100m² area of pine floor, both shaking out carpets and sieving leaf litter underneath to soil level
- Mark all chosen species with nail varnish
- Leave to mix for one hour minimum
- Return and re-sample
- Calculate population based on formula:
$$\frac{n1 \times n2}{n3}$$

**= (sample 1 x sample 2)
no. marked individuals in 2nd sample**
- Assess reliability of Lincoln Index technique (*particularly useful if this has already been tested in controlled conditions in school*). Data on previous Lincoln Index experiments at Wildwood available.

Small mammal trapping:

- Wellfield small mammal traps laid out on standardized grids and/or transects
- Discuss trap design
- Usefulness of trapping v risks
- Animal welfare issues (bedding, food, heat, cold and rain, cannibalism and predation)
- Trappers' responsibilities
- Licensing requirements and safety (shrews)
- Percentage of trap occupation
- Reliability of technique as one off experiment v regular trapping
- Seasonal effect (higher trap occupancy October-March, gender/season bias)

Day 2/3:

- Students working in pairs on their own projects, either under Wildwood or teacher supervision
- Examples of projects selected by previous students:
 - leaf litter invertebrates within 1m radius of mature trees of similar trunk radius in two different habitats (Corsican pine in pine forest and English oak in broadleaved coppice) – *quadrats on compass points*
 - centipedes in leaf litter in different woodland habitats (*sieves and trays*)
 - invertebrates on bramble in different woodland habitats and light/shade factors – *beating and sweeping*
 - bush crickets on sweet chestnut coppice (*beating tray*)
 - plant diversity within different woodland habitats and light/shade factors – *quadrats and transects*.

Please see full list of suggested investigations at end.

Wildwood Equipment List

We can provide basic equipment for the teaching day and for students to use when carrying out their own investigations. We also have a limited number of light meters, humidity meters and temperature probes which students are welcome to borrow.

We can supply:

- 30 x 1m² quadrats (better for the larger woodland plants than half-metre ones)
- 30 x large sieves
- 30 x large trays
- 30 trowels
- 5 x 10m tape measures
- 30 x pooters
- 5 x light meters
- 5 x temperature probes
- 8 ranging poles

Schools usually supply:

- Clipboards
- Pencils
- Notebooks/paper
- Equipment for the students' own investigations, e.g. data loggers, light/soil humidity meters, additional canes for transects and string, small quadrats, sweep nets, pH testing kits, long tape measures, metre sticks, etc.

Dressing for Wildwood

Wildwood is an ancient woodland site that has always been traditionally managed by coppicing. The animal collection is housed in natural woodland enclosures and the paths are lined by dead hedges, from the coppiced timber. Woodland ecology students work off

the paths and will have to be prepared to scramble over logs, jump small dry ditches, brush past brambles and nettles and cope with rain, sunshine, wood ants and other creepy-crawlies.

Please advise them to wear/bring:

- trainers or other sensible footwear
- long trousers (jeans are best)
- hats and sun cream if very sunny
- large bottle of drink if hot
- waterproofs/wellies in case of rain.

Anne Riddell
Head of Education

Woodland Ecology: sample investigations for A level/IB students

- Comparison of ground flora in different ages of sweet chestnut coppice (quadrats/transects).
- Comparison of ground flora in human coppice and beaver coppice (quadrats/transects)
- Comparison of one plant species' distribution according to light intensity from coppice edge into woodland (transects). Recommend bracken, bramble, nettle, honeysuckle or wood sage.
- Comparison of leaf litter invertebrates within 1m radius of 1) Corsican pine and/or 2) English oak and/or 3) sweet chestnut/ silver birch and/or 4) standing coppice stool and felled stool (quadrats).
- Comparison of spiders, bush crickets or other invertebrate species on bramble bushes/coppice (weather dependent) in different locations/sun/shade (beating and sweeping using trays) - *species relevant to season*.
- Comparison of leaf litter invertebrates on the woodland floor and in the leaf-filled dry ditches (sieves and trays).
- Comparison of leaf litter invertebrates within 1m, 3m and 5m radii of wood ant nests.
- Comparison of distribution of wood ant nests in different woodland types or sun/shade (measurement of size, light, activity, etc.).
- Comparative investigation of wood ant nest activity according to ambient temperature and nest temperature in sun/shade.
- Distribution of leaf litter invertebrates within 1m radius of tree species (e.g. oak, Corsican pine, silver birch) according to tree's girth and estimated age (quadrat)
- Comparison of leaf size/shrub height of bracken/bramble in sunshine and shade or pine and coppice (transects).
- Comparative investigation of butterfly distribution/activity on bramble in different light situations (seasonal, visual, weather dependent).

N.B. If your syllabus requires that every student carry out a different investigation or that all investigations are conservation-linked, we do have further suggestions available – please ask.