

Heritage & Habitat in Your Community

Teachers' Guide



by

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**Comhairle Contae
Dhún na nGall**
Donegal County Council

An Chomhairle Oidhreachta
The Heritage Council



County Donegal Education Centre
Ionad Oideachais Chondae Dhún na nGall

An Action of the County Donegal Heritage Plan

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1. Introduction

County Donegal's Heritage Plan has as one of its main aims, the raising of awareness of the natural, built and cultural heritage of the county. One of the ways suggested of doing this is by developing interest in and knowledge of this heritage through education and training. The heritage of the county presents enormous educational opportunities at primary, secondary and tertiary levels. The investigation of these heritage resources can address education curriculum requirements while raising awareness of their importance among the students. This report is produced as a response to Action 4.3 in the County Donegal Heritage Plan, which is to "Establish a habitat survey project for schools".

The EU Directive on the Conservation of Habitats, Flora and Fauna, commonly known as the Habitats Directive, came into force in 1994 and was transposed into Irish law in 1997. Its main aim is to maintain favourable conservation status for habitats and species considered to be at risk. Key sites have been designated as Special Areas of Conservation (SACs) and there are 46 of these in County Donegal. Habitats that are nationally important for birds are protected under a different EU Directive – the Directive on the Conservation of Wild Birds (1979).

These are called Special Protection Areas (SPAs) and there are 26 of those in County Donegal. As well as these, there are also important habitats for wildlife protected under the Wildlife Act 2000, which are known as Natural Heritage Areas - NHAs. County Donegal currently has 12 of these. One of the aims of the County Heritage Plan is improve awareness of these key wildlife areas.



Initially a pilot project was carried out in two Donegal schools – Magh Éne College in Bundoran and St. Columba's Comprehensive School in Glenties, both of which actively volunteered to take part. It was presented as a joint geography - biology study of a habitat in the locality, chosen because of its heritage value.

The project involved site selection, ecology fieldwork and recording, analysis of results and their presentation by the students in a written report. This work was carried out from October to December 2013. Figure 1 shows all the protected sites in the vicinity of the two participating schools.

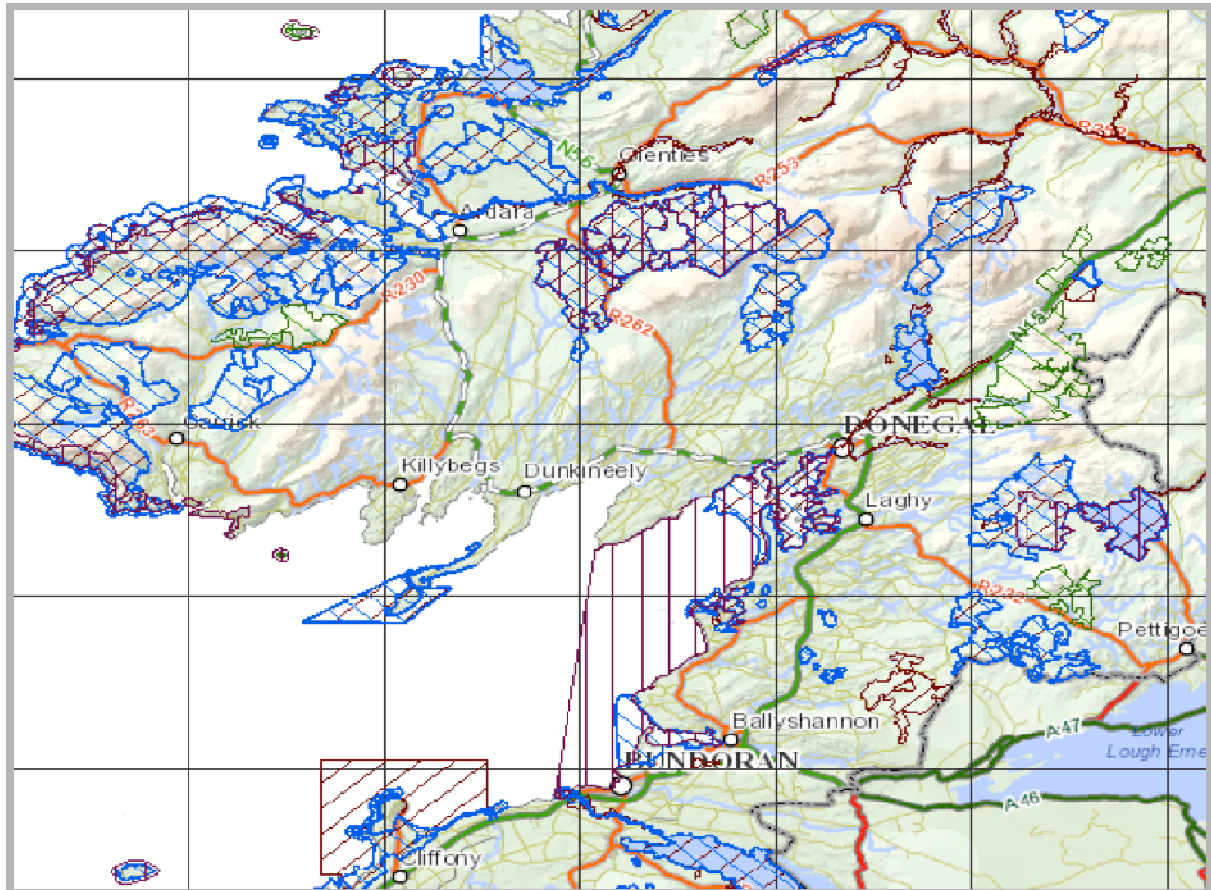


Figure 1: Online Map of Some of Donegal's Wildlife Heritage Sites - National Parks & Wildlife Service
See www.npws.ie

This pilot study informed the drawing up of this guide to studying habitats and heritage in Donegal. The habitats studied by the schools were blanket bog and rocky shore. This guide covers these two important Donegal habitats, but it also covers four other habitats of importance – deciduous woodlands, hedgerow, grassland and freshwater streams.

2. What this Guide is for

This habitat survey project is developed in the first instance for Transition-Year students in Post-Primary Schools. In Primary Schools, the Social, Environmental and Scientific Education curriculum ensures that pupils leave at the age of twelve with considerable knowledge about the wildlife present in local habitats. In Post-Primary Schools however, this knowledge is allowed to lapse. Apart from a small ecology section in the Biology Section of the Junior Cert Science syllabus, pupils are not taught about heritage and habitat until fifth year and only then if they study geography or biology. This guide therefore is to enable Transition-Year teachers carry out a habitat and heritage study with their pupils, taking account of the level of knowledge they are likely to have at this stage.

Indeed it is suggested that the proposed new Junior Cert syllabus should contain a short course covering this area in order to ensure that Post-Primary students retain their awareness of the importance of wildlife habitats in their areas.

The effectiveness of any course of study can be assessed by measuring how well its aims have been realised. The aim here is to establish a habitat survey project for schools which can address education curriculum requirements while raising awareness of the importance of heritage resources among the students. This guide includes a way of measuring their learning by means of a questionnaire administered to the participants before and after the habitat study is complete.

The questionnaire in Appendix 1 was used in the pilot study and modified somewhat as a result. By using exactly the same questionnaire both before and afterwards, it is easy to see how effective the habitat project study is. In the pilot study, the students' awareness of their heritage, of important habitats in their locality, of the biodiversity of these habitats and the pressures on them is shown to be very significantly improved as a result of carrying out this project.

Note that using this questionnaire to measure students' learning is a very important part of this study.



3. How to Use this Guide

This guide has been designed to assist Transition-Year teachers and coordinators plan, prepare for and carry out useful fieldwork, which will explore some readily quantifiable aspects of natural heritage in suitable areas. While this guide will take you step-by-step through the process, you'll still need to seek out information on the particular habitat you choose for your study. Luckily, there are now many excellent resources that are easily available either online or in print that will greatly assist you. There is a complete list of these with some hints in **Section 7** of this guide. However, if you are fortunate enough to know a local natural history expert in your area, you would be well advised to seek them out for their advice and assistance. Don't worry if you can't, this guide has been designed to take the fieldwork novice through the process with easily achievable tasks. So, where do you start?

Step 1: First Session (Classroom-based)

The authors have devised a questionnaire devised to test students' knowledge before and after any classroom or fieldwork. This is found in **Appendix A**. Allocate a class period for the purposes of introducing the project. Before you have any discussion with your students on the forthcoming project, give out the questionnaire to **every** student who is participating. Give the students around 15 minutes to complete them, then gather them up for analysis at a later date.

You are advised to spend the rest of the class exploring the concepts of heritage, habitats, wild species and protected areas. Some key questions or topics might include:

- What does heritage mean to you?
- To whom does heritage belong?
- What is *natural* heritage? Examples?
- Are there any threats to aspects of natural heritage?
- Why should we protect our heritage?
- What areas nearby do we know of that might be of importance?

Let the class know that the task at hand is now to try and find important natural heritage areas in your locality that might be visited for the project.

With the aid of a digital projector and PC, you can then utilise some of the online mapping resources to gain clues as to important (such as protected) areas for natural heritage. See **Section 4** for details of these resources. With the class, use the remainder of the period to look for such areas in your locality using your class' knowledge of mapping features (such as watercourses, contours and woodlands) to assist you. Draw up a list of potential sites you can find within a reasonable distance from your school. Tell your class that one of these will be the venue for your fieldtrip, which will be held next week.

Now, you may already have a good idea as to what type of habitat would be best suited to your study. There are six habitat types described in **Section 5**. These have been chosen to best represent potential study sites in County Donegal. Have a look at these and the accompanying worksheets to help you decide. The most popular choice among your students will of course be a factor in your final decision. **Section 4** lists the other main considerations in site selection. If you can at all, you should briefly visit the site yourself before your next session.

Step 2: First Fieldwork

Today you will undertake your first fieldtrip. However, you will start this in your classroom. Display with the projector the site you have selected. Encourage the class to derive as much information as possible from maps and aerial photography of this site. Talking points should include:

- What kind of habitat are we looking at?
- How might this have been formed?
- Can we tell what kind of land or other habitats might be around it?
- How is the site used, if at all?
- Finally - how do we get there?

Then, it's off to your selected site and your first fieldwork session. **Section 5** lists the very small amount of materials you'll need. In the worksheet in **Appendix B**, you'll find all of the key questions that are to be answered on the day. These relate to taking in as much preliminary and background information as you can on your first session on the ground. There is also a mapping exercise to which around a quarter to a third of your time should be allocated. While students may work as individuals, you are advised to split them up into teams of 2s or 3s - depending on the size of your class. Tell them to pick the best artist or technical graphics student among them to do the mapping!

Step 3: The Main Fieldwork

Today is your main fieldtrip. Make sure to check your required equipment list (**Section 5**) and that each team has clipboards, pencils and particularly important, the map they drew on their first fieldtrip. You are advised to distribute the appropriate fieldwork sheets for today (found in **Appendix C**) while you're in the (dry and non-windy) classroom, with each team confirming that they have a set.

Following the directions given in your worksheets, complete as many exercises as you can in the time available. Make sure that all of the teams keep up with the activities (especially those involving measurements) and aren't left scrambling to fill in answers.

When you're happy that the exercises are completed and enough details recorded, gather up the worksheets from the teams and retain for Step 4 - the 'write-up'.

Step 4: The Write-Up

This is the stage where your class - with your help - interprets and analyses the results. These must then be presented in print or digital format. You are referred to **Section 6** for guidance in this regard. It is recommended that you devote at least 3 periods to this stage of the project. You should probably also allow another 2 weeks for the teams to complete the layout and editing of their work. Ideally, the groups should have the opportunity to present some of this work to the class to develop their presentation skills.

4. Preparing for your Fieldwork

Selecting a Site

The overriding consideration in choosing a site for your fieldtrip is how representative the site is to the habitat you have chosen to study. There are, of course, many other factors to consider - among these are how easy the site might be to access, the fragility of the site and, of course, safety. However, you want your group to see the best possible examples of your chosen habitat so you should look first for sites known for their species and habitats.

Designated & Protected Sites

Luckily, the National Parks & Wildlife Service (NPWS) has an extensive database of such places, these are the sites designated and legally protected for the conservation of nature. You can access this database on www.npws.ie/protected-sites. In Donegal, there are 84 such sites. There are 46 Special Areas of Conservation (SACs). These are sites that the EU requires us to designate and protect for the conservation of a number of habitat types and species. These are of the most importance in terms of conservation and will generally have very good examples of habitats. There are 12 Natural Heritage Areas (NHAs). These are the main sites designated for wildlife protection under Irish legislation. These are areas considered important for the habitats present or hold species whose habitat need protection. There are also proposed Natural Heritage Areas (pNHAs) which have been chosen for designation but are not yet legally protected. It's worth looking at your nearby Special Protection Areas (SPAs). These are sites designated by European law for the protection of wild birds and their habitats. You can download brief descriptions of all of these sites (called *Site Synopses*) from the NPWS website. These list the habitat types present and notable species found there.

There are also 10 National (statutory) Nature Reserves in Donegal and one National Park (Glenveagh). These are areas owned and/or managed by the government for nature conservation. These will have excellent examples of habitat types. You are strongly advised to contact the NPWS for advice on suitable sites. Their headquarters in Dublin will connect you with your local wildlife ranger or call the Donegal office at (0761) 002 541.

Other Sites

You may well have non-designated sites close to you that have good examples of habitat types. These might be woodland owned by Coillte which has many sites of great local value, some of which are managed for recreation and educational visits. These sites are listed by county on www.coillteoutdoors.ie. This website provides great practical information such as mapping, trails and parking facilities. There are 7 'Coillte Outdoors' sites in Donegal. Some of these provide safe access to more than just forestry. For example, the Ards Forest Park (near Creeslough) includes sand-dune, salt-marsh and lakes as well as quite diverse woodlands. Coillte have an office in Ballybofey and can be contacted through 1890 367 378.

Other sites might be found by asking local experts or enthusiasts. You may not have any natural history buffs in your area so it's worthwhile contacting conservation organisations such as BirdWatch Ireland and the Irish Wildlife Trust. Both of these organisations manage sites for nature and also work with landowners who keep their lands in a nature-friendly fashion.

If all of the above don't yield potential sites, you can also do some research yourself. The advent of online mapping has made this easier than ever, as the next section explains.

Mapping Online

There are a variety of online mapping tools at your disposal. If you want to search for the designated and protected sites in Donegal (or any county) you can go to www.npws.ie/protected-sites and search by county, type of site and even by habitat type. This website has an invaluable mapping tool that shows the location and extent of all of the designated sites. A data search facility allows you see what species are recorded there.

Ordnance Survey Ireland has a web-based public map viewer (at <http://maps.osi.ie>), which provides satellite and aerial photography for all of the Republic. The mapping includes roads, rivers and relief. The orthophotography allows the user to identify main land-uses as well as natural features.

The Geological Survey of Ireland has an excellent mapping system (www.gsi.ie/mapping.htm), which allows the user to accurately measure distances and surface areas as well as zoom in close to areas of interest.

www.biology.ie provides a handy mapping site which allows the user to find grid references and latitude/longitude (and also convert these) simply by clicking on the point on the map.

Timing Your Fieldwork

When should you carry out your fieldwork? Ideally, you should get to see the site when the greatest number of representative species such as flowering plants will be seen. Unfortunately, in Ireland this usually means during summer months when your school is either on holidays or preparing for examinations. Late spring and early autumn are therefore the best times for most visits. These will allow you to see many species as well as have time to write up your findings. The table below can guide you on fieldtrip timing.

Habitat Type	Jan	Feb	Mar	Apr	May	Sept	Oct	Nov	Dec
Seashore	Sub-optimal	Optimal	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal	Not advised	Not advised	Sub-optimal
Woodland	Sub-optimal	Sub-optimal	Optimal	Sub-optimal	Sub-optimal	Not advised	Not advised	Sub-optimal	Sub-optimal
Hedgerow	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal
River/ Stream	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal	Sub-optimal	Not advised	Sub-optimal	Sub-optimal
Boglands	Sub-optimal	Sub-optimal	Optimal	Sub-optimal	Sub-optimal	Not advised	Not advised	Optimal	Sub-optimal
Grasslands	Sub-optimal	Sub-optimal	Optimal	Sub-optimal	Sub-optimal	Not advised	Sub-optimal	Sub-optimal	Sub-optimal

Optimal	Sub-optimal	Not advised
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Access, Health & Safety

Before undertaking any fieldtrip, it is highly advisable to visit the site first by yourself. This will allow you to consider some of the practical aspects of your planned trip. Firstly, how will your group get there? Ideally, but rarely, the site will be within walking distance of your school. More often, transport must be arranged. If your group comprises any more than 15 students, a larger bus will be needed. Is there space to park this and can it turn? Will the students have to walk across a busy road to the study site? If the site is gated or has a barrier, will this be open on the proposed date? You are advised to identify a contact and telephone number in case of unexpected closure of the site. If your group must travel any distance on foot from the road, how long will this take? Build into your calculations any stops along the way that you may wish to carry out for demonstrations. Also remember that when you return with your group, you may all be carrying equipment which could make the going more difficult.

Take note of any boundaries that you may have to cross. Look for safer, established crossing points such as stiles and bridges but do bear in mind that some 'off-road' walking will probably be involved. You may find it a useful exercise to carry out a risk assessment before your first visit with the students. This helps to focus your thinking on what steps you might take to make the trip as safe as possible. Your school may already have such an assessment completed but much information is provided on the Health and Safety Authority's website (www.hsa.ie), including templates for creating risk assessments.

How Long Will Our Fieldwork Take?

This guide recommends that you undertake at least 2 visits with your class. The first visit is primarily reconnaissance. That is, you will be introducing your class to the site - its extent, topography, defining characteristics, usage, habitats and species. The students should make initial sketches, take pictures and record grid references. Please refer to our sample First Fieldwork Sheet in Appendix B. It is recommended that you allow for around an hour and a half for the first visit.

The second fieldtrip will require more time. Your group will be carrying out some specific investigations which will require some setting up of equipment, measuring and recording. There will also be an element of mapping 'on the ground', as well as plant and animal identification. It is recommended, that you therefore allow around two-and-a-half hours for the second visit. Bear in mind that you'll be carrying equipment, notes and clipboards which may slow you down.

What Stuff Will We Need?

The most important items on your list are your worksheets. These will be used to guide your students' work as well as recording the all-important data. It is highly recommended that you devise your own worksheets for your fieldtrip. These will then be of the best possible design to suit your needs. Examples of useful worksheets are given in Appendix B. These can be modified to suit your own trip. It is recommended that no more than 5 or 6 sheets are used for any one trip, to avoid confusion. Sheets should be clearly marked and numbered. Clipboards are highly recommended. If they can have a plastic cover to keep the rain off, so much the better.

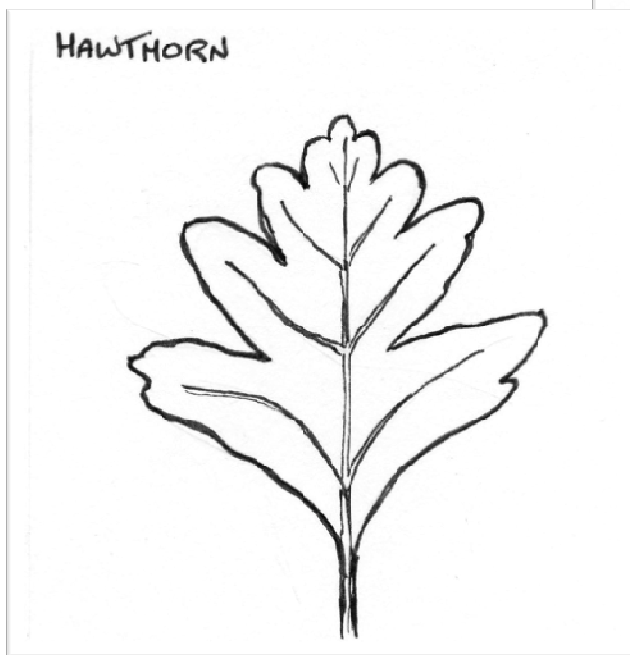
Some of the fieldwork equipment that you're likely to need is described below.

10m transect: a transect is simply a straight line between two points across a given area. Two sticks or pegs with a 10-metre length of strong twine tied between them will suffice. It is recommended that you use a bright colour of twine! You can make 1m 'stations' on the transect by tying knots in the string or staining it with waterproof permanent marker at the correct intervals.

Quadrat: the quadrat is a square shape of known size that is used to delineate or frame an area for study. For ease of calculations, the 1m² quadrat is often used. However, a 0.5m² quadrat is much sturdier, lighter and easier to transport. The quadrat may be subdivided with a grid, which helps in assessing surface areas. Quadrats may be used in a variety of ways. They may be used in conjunction with a transect - along a straight delineated area - or in a semi-random fashion. This last is often achieved by the user throwing the quadrat over their shoulder (having first made sure that it is safe to do so!).

Clinometer: This device is used for measuring slope (elevation / depression). It may be used in conjunction with a transect if the two sticks and pegs are of known height and placed in the ground to the same depth. A separate line tied between two broom-handles (measured and marked to act as ranging poles) may be used. The clinometer may be held against the string and the angle of depression/elevation read off. A protractor and a suspended weight may also be used to make your own clinometer.

5. Your Fieldtrips



Boglands

Donegal's boglands are all blanket bogs. They are really important habitat areas in the county with 24 of them designated as prime wildlife conservation areas. They consist of carpets of peat up to 3.5 metres deep, extending over large areas. They are only formed where there is very high rainfall – typically 175 rain days. This high rainfall waterlogs the soil, rendering it very poor in oxygen. As a result, plant decomposition cannot take place and the dead plant remains accumulate as peat. This peat has a very low pH, typically around 4.2. Blanket bogs began to form 7,000 years ago and those that are undrained and uncut are still actively growing.

The main vegetation is *Sphagnum* moss, which is entirely dependent on the rainfall for its nutrient supply. Typical bogland plants have a network of air spaces in their stems and roots so that they can grow in these waterlogged conditions. As well as many different species of *Sphagnum* moss, blanket bog vegetation will include purple moor grass, black bog rush, bog cotton, sundew, tormentil and lousewort among others. Heather will grow on the drier areas. Birds will either live there and breed such as red grouse, skylark, meadow pipit and curlew or else will use it to over-winter as do golden plover, Greenland white-fronted geese and snipe.

Insects such as emperor moths that feed on heather and dragonflies and damselflies that use the pools for breeding are typical. Frogs and newts live here and the area is visited by Irish hares and foxes.



Fieldtrip to a Bogland

First Field Trip

Items Needed: Observation Frame to help with drawing map. **Field Trip 1 Worksheet.**

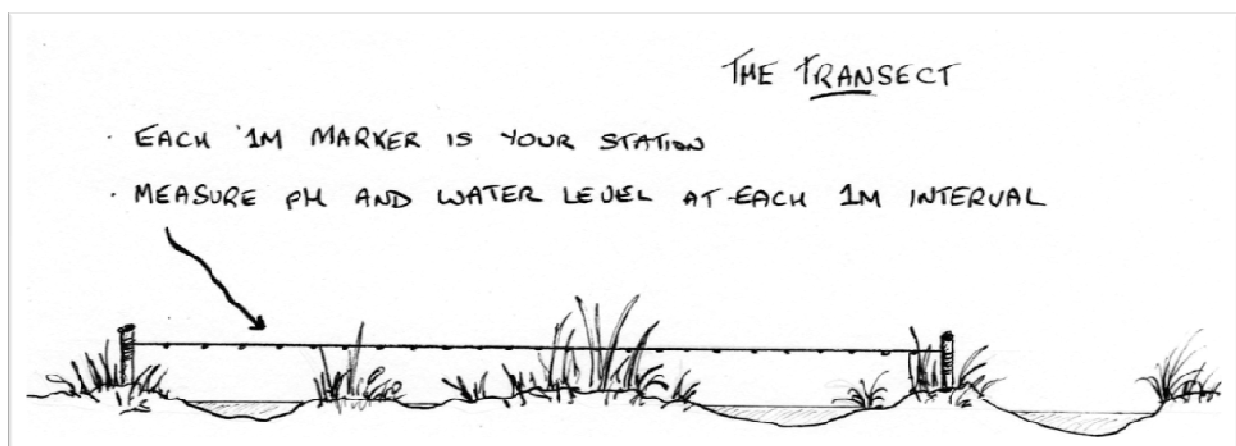
Having selected this area of blanket bog as a result of mapping exercises and class discussion, the aim of this first fieldtrip is to become acquainted with the site and to decide what fieldwork exercises will take place and where exactly they will be carried out.

- Students walk through the site noting the habitats present. These could be untouched bog, cutaway bog, hummock/hollow areas, particularly wet areas, drier areas with heather, areas where trees are growing, cut turf face. These will be noted on the Worksheet.
- They should note any obvious plants or animal species (these include birds and insects as well as mammals and amphibians), and record in which type of habitat they were.
- They should look out for key environmental factors which have an impact on the plants and animals there such as slope, availability of water, light and exposure.
- Usage of the site.
- Pressures on the site that can affect it detrimentally.

On completion of this observational walk, they should pick a place with a good view of the whole area and draw a map. An observation frame can be used for this to get an accurate perspective. Be sure to mark in large features such as trees, paths and open areas of water. The test of a good map is that it can be used by a newcomer to find the exact study site.

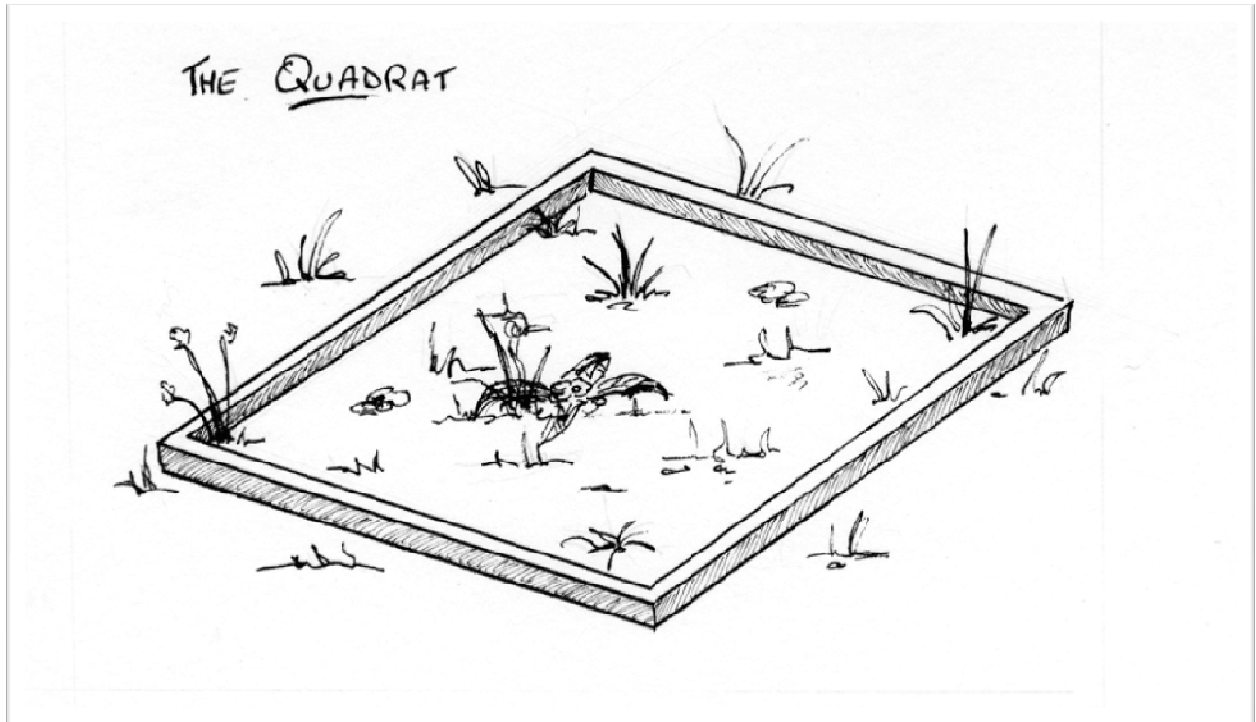
Follow-up

On return to class, there should be a discussion as to what will be studied on the next main fact-finding fieldtrip. Vegetation Study – transect or quadrats? Which abiotic factors should be measured? How to find out what animal species are present.



Second Fieldtrip

Items Needed : Quadrats - ideally one per group. Tape (or ropes marked at 50 cm intervals) for transects, metre sticks, string and spirit level if measuring slope or indeed a clinometer, pH meter. Metre sticks to measure water depth. Nets and jam jars if there are open water areas. Sleán (turf-spade) ideally or at least a garden shovel to cut a sod of turf. **Fieldtrip 2 Worksheet.**



Tasks

Vegetation description in each of the habitats identified (uncut bog, cut over bog, dry area, very wet area as appropriate). Several groups of students allocated to each of these areas. Quadrat thrown randomly three times and the plant species present listed (or described) and their abundance noted.

pH measurement: Line transect laid down going from one habitat type to another (say uncut to cut or very wet to drier) and the pH noted every 50 cm.

Water level can be noted at each 50 cm interval as well by seeing how far up it comes on a vertically held metre stick.

Slope can be measured using metre sticks, string and spirit level or using the clinometer.

Bird recording: Any passing bird should be noted. Ten minutes should be set aside to listen for bird song and particularly to note and count any birds seen.

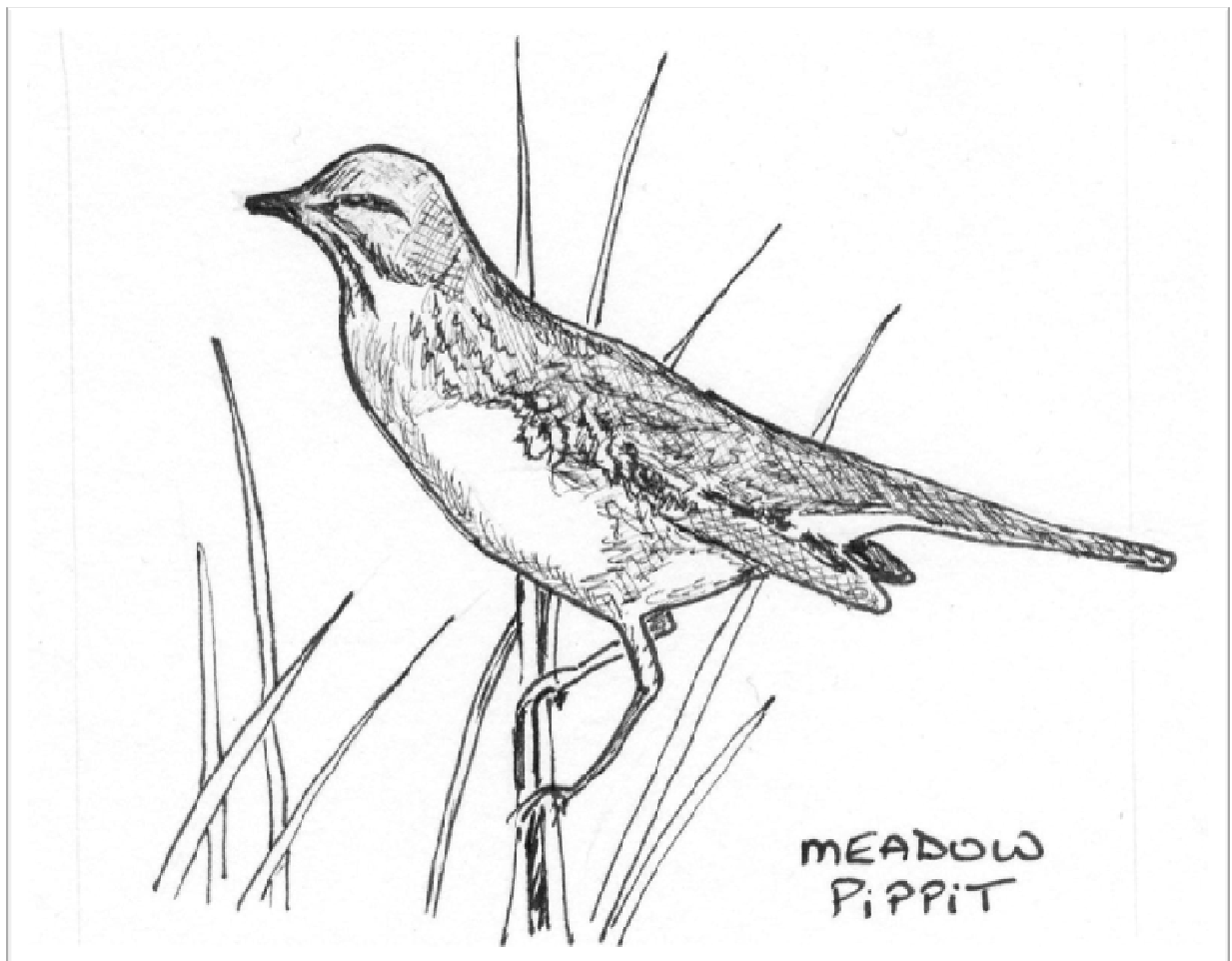
Amphibians: An eye should be kept open for frogs and any open water areas investigated with nets to see if newts are present.

Mammals: Most likely only detected by prints or droppings.

Insects: Look out for flying insects, caterpillars on vegetation or insects in or on standing water.

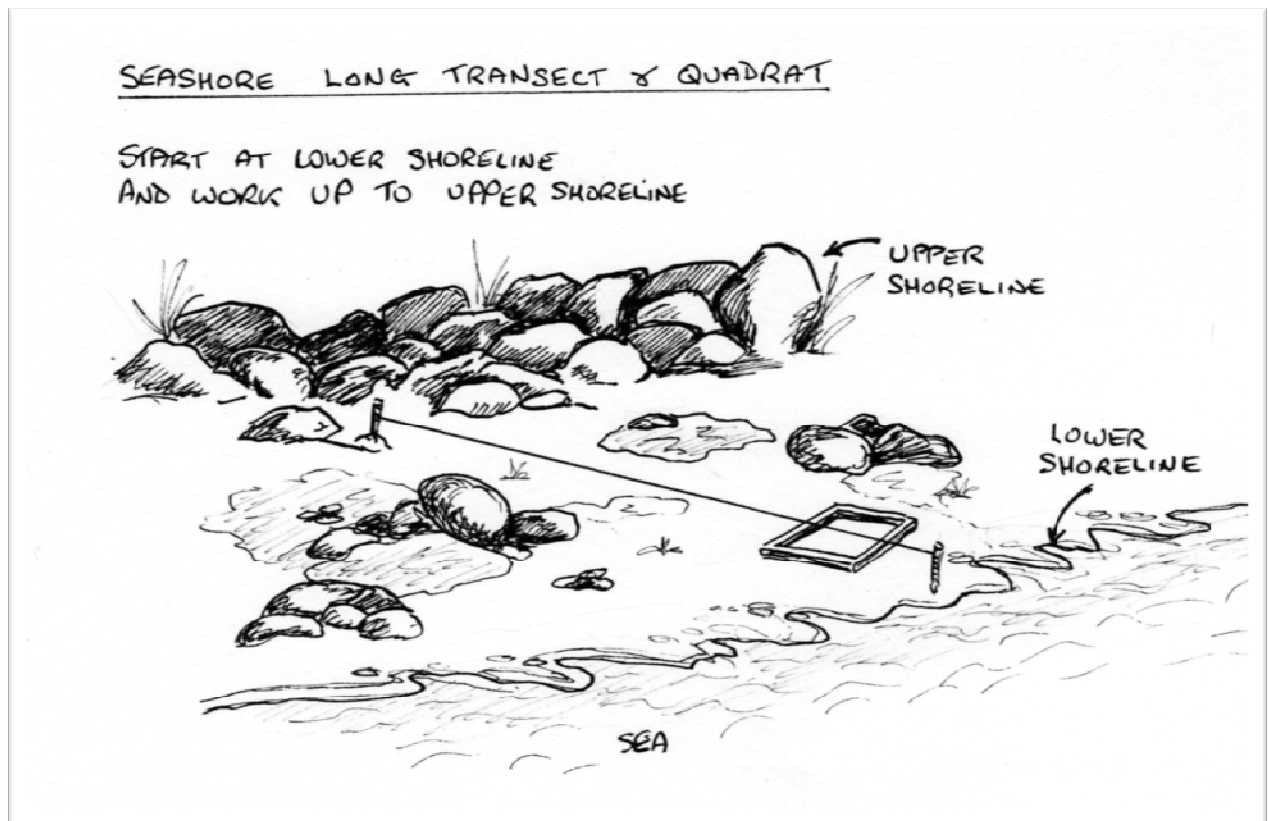
Visit to Cut Turf Face

A special effort should be made to find a cut turf face where turf cutting by hand was carried out. Be careful approaching it particularly from the lower side as the ground may be very soft. This bank will demonstrate how the turf changes with depth. Use the sleán (or the spade) to cut a few sods of turf and examine them. Two layers are immediately obvious. The top layer is where the live plants are and is less than 30 cm deep. Below this is the turf layer. The top of this may be dried out and brown and crumbly. But if it is a deep turf face of two metres or more, it will be obvious that the turf becomes much wetter and darker in colour with depth. If it goes right down to the bottom of the bog, there may be a mineral soil layer at the bottom where once pine trees grew. Remains of this bog deal can sometimes be seen.



Coastal Habitats

Thirty-six of Donegal's prime wildlife conservation areas include coastal habitats so these contribute enormously to the county's biodiversity. The type of habitat in each instance depends on the interaction between the sea and the land's edge. Where the coast is hard and resistant, erosion takes place. Depending on the height of the land, the result can be cliffs, rough broken coastline or rocky shore. Many of these are particularly important for breeding seabirds and are designated as Special Protection Areas (SPAs).



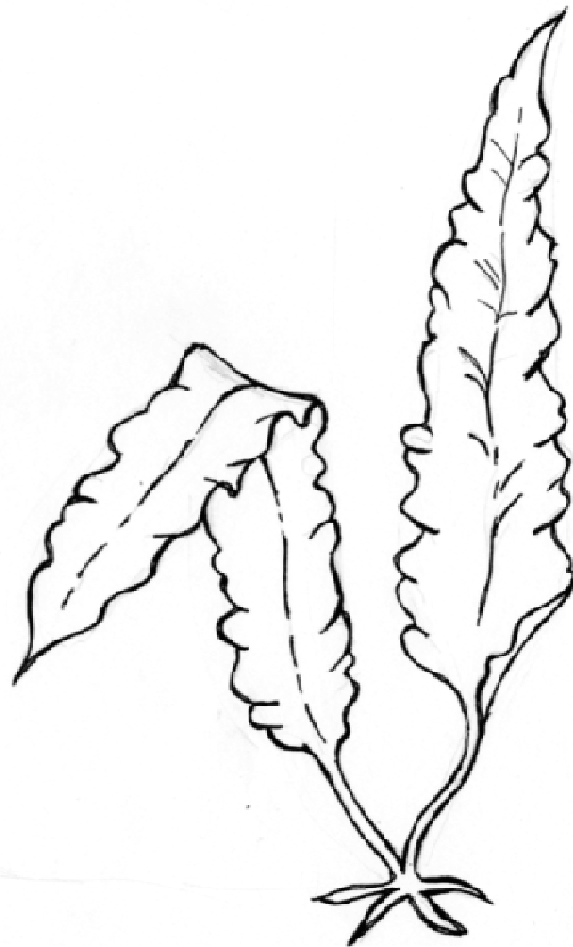
Ocean currents, moving very fast, carry large amount of sand and sediment. Where they are slowed down by a headland or an estuary, they deposit these sediments and sand dunes formation can take place. If the currents are slowed up completely, the very finest mud particles are dropped, giving rise to salt marshes. Where a river enters the sea at a wide estuary, it too can drop its sediment load as it slows down leading to the formation of mud flats, which are exposed when the tide is out. Sand dune systems in Donegal are very exposed to strong Atlantic winds and a particularly important habitat called *machair* is created when calcareous sand is blown in by prevailing winds from beaches and dunes. These are all specialised grassland habitats and are covered in the grassland fieldtrip.

SEA ANEMONE



The rocky shoreline is the safest and most accessible part of the hard eroding coastline type of habitat to visit on a fieldtrip. Plant and animal life in this habitat is governed by how long any part of it is covered by the tide. The upper shore – furthest away from the water's edge – is exposed the longest and wildlife here has to cope with being dried out or being affected by fresh water in rainfall. Animals here have to adapt to being exposed, being dried out and having long periods without the food brought in by the tide. On the lower shore, these conditions are much less severe so there will be greater quantities of wildlife and a greater abundance of species.

SEAWEED



Fieldtrip to the Rocky Shore

First Field Trip

Items Needed: Observation Frame to help with drawing map. *Fieldtrip 1 Worksheet*.

N.B. It is very important to visit the rocky shore when the tide is out so that the whole habitat can be accessed.

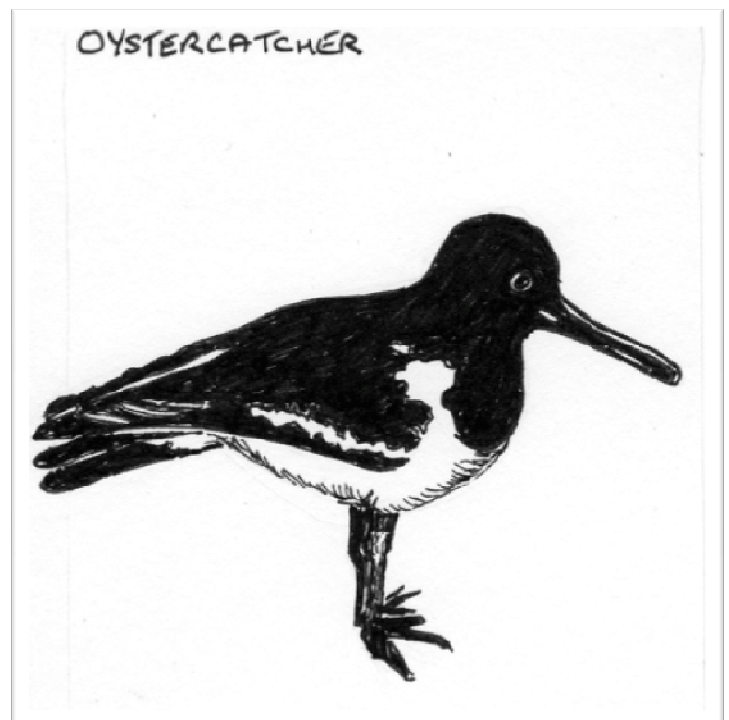
The aim of this first fieldtrip is to become acquainted with the site and to decide what fieldwork exercises will take place and where exactly they will be carried out.

- Students should initially stand at a distance from the shore so that they can observe the birdlife present without disturbing them. There may be birds in the water resting or feeding such as gulls or ducks. There may be birds walking through the rocks and seaweed looking for food – oystercatchers, grey heron, rock pipits or even hooded crows while exposed areas of mud and sand may have waders such as redshank or dunlin.
- Students walk through the site noting the areas of the shore – upper, middle and lower shore. They should look for rock pools and for open sandy or muddy areas. These all should be noted on the Worksheet.
- They should observe which areas have the most seaweed present and whether it is mainly green, brown or red seaweed.
- They should look out for key environmental factors which have an impact on the plants and animals there such as slope, distance to the water's edge and exposure.
- Usage of the site.
- Pressures on the site that can affect it detrimentally. This can include evidence of erosion as well as human pressures.

On completion of this observational walk, they should pick a place with a good view of the whole area and draw a map. An observation frame can be used for this to get an accurate perspective. Be sure to mark in such features as access points, high tide mark, low tide mark and any particularly notable rocks. The test of a good map is that it can be used by a newcomer to find the exact study site.

Follow-up

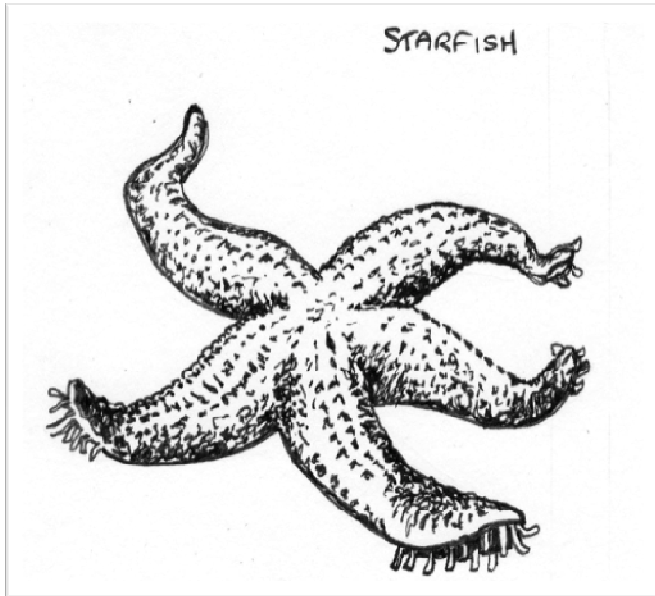
On return to class, there should be a discussion as to what will be studied on the next main fact-finding fieldtrip. Seaweed Study – transect or quadrats. How to measure the slope of the shore. Which abiotic factors should be measured. How to find out what animal species are present.



Second Fieldtrip

Items needed: Quadrats - ideally one per group. Tape (or ropes marked at 50 cm intervals) for transects, metre sticks, string and spirit level if measuring slope or indeed a clinometer. Nets and buckets if there are rock pools.

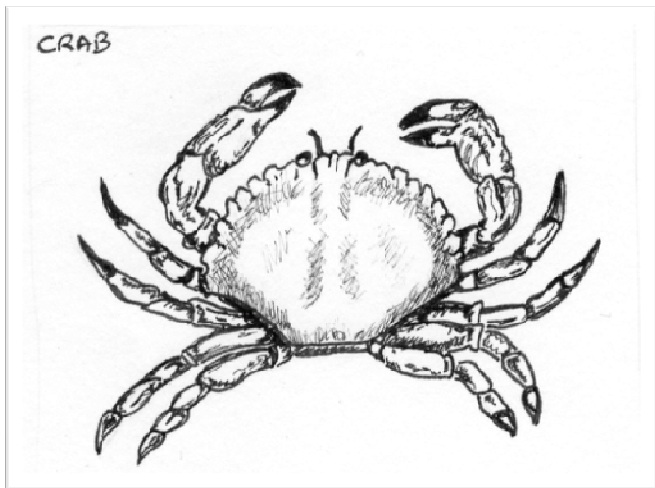
Fieldtrip 2 Worksheet.



Tasks

Species of the rocky shore: The line transect is laid down the shore from the upper shore to the water's edge. Start at one end – depending on whether the tide is still falling or beginning to rise and record the living things at each recording station. Place the quadrat and note the seaweed species present and then the animal species. Repeat this at regular intervals all the way to the end of the transect.

Slope of shore: Use standard slope measurement procedures with a line parallel to the line transect above.



Rock Pool Examination: Examine the sides and bottom of the pool, noting both seaweed species and animal species. Use the net to catch swimming animals.

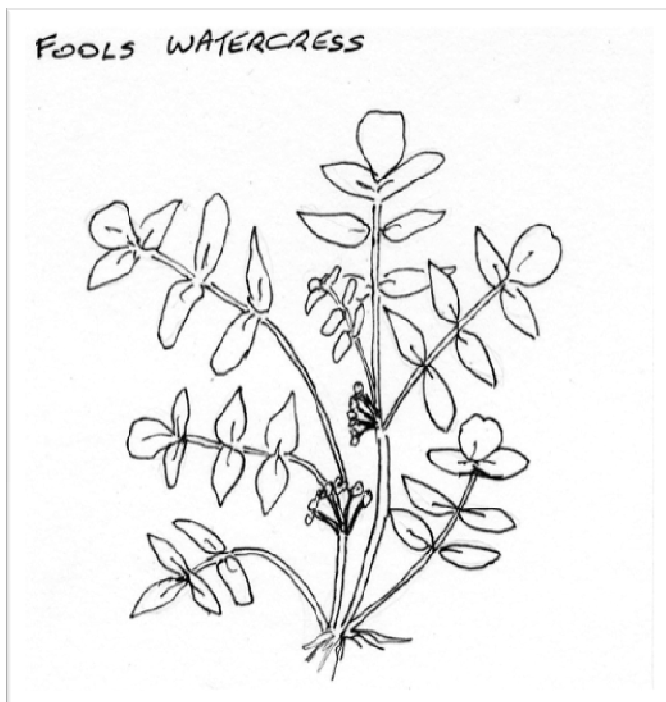
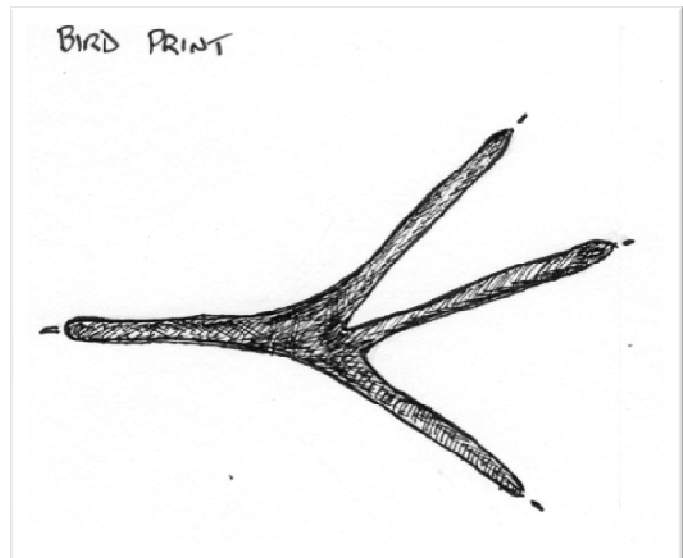
Bird recording: Note any birds, seen, what part of the shore they were in and what they were doing.

Mammals: Foxes scavenge on the rocky shore, their droppings may be detected. Otters may sometimes be seen near the shoreline in daylight. Keep an eye open for seals.

Freshwater Habitats

Freshwater habitats include rivers, streams and lakes. Clean unpolluted areas of freshwater are particularly valuable as wildlife habitat and they are becoming rarer and rarer due to human activity. Twenty of Donegal's prime wildlife conservation areas include freshwater habitats – lakes and rivers – and some extend to whole river catchment areas. These areas are particularly important for fish species, for birds and for invertebrate life.

The amount of dissolved oxygen in the water is key to the diversity and richness of freshwater habitats. Organic matter, whether natural dead plant and animal material or human-created such as sewage or slurry, is all broken down in the water by bacteria. These need large quantities of oxygen to do this, they have first call on it and, as a consequence, in polluted waters there is very little left for other freshwater species. Some species are particularly sensitive and can only occur in pristine waters. Others can tolerate some pollution.



So by knowing what invertebrate life is in the water its quality status can be determined. This is known as the Q-scheme method whereby a Quality-index is assigned to a river or stream based on macro-invertebrate data. This is generally derived from the presence or absence of certain insects and other invertebrates. The Q-index is a quality measurement ranging from Q1-Q5 with Q1 being of the poorest quality and Q5 being pristine/unpolluted. A stream of good quality (Q4 or Q5) will have good numbers of insects such as mayfly and stonefly, whereas a stream of poor quality (Q1 or Q2) will have none of these but will have large numbers of creatures like leeches and worms that can survive well in low oxygen conditions.

Small shallow streams, where the students can get into the water and search for invertebrates are the most suitable and safest freshwater habitats to visit on a field trip.

Fieldtrip to a Small Shallow Stream

First Field Trip

Items Needed: *Fieldtrip 1 Worksheet.*

This site will have been selected as a result of mapping exercises and classroom discussion. The class will be aware that this stream feeds into a larger river or that it flows into a lake. They should also be aware of the catchment area of the stream and the land-use/human population of the catchment area. These are major factors in the well-being of small streams which are very sensitive habitats.

The aim of this first fieldtrip is to become acquainted with the site and to decide what fieldwork exercises will take place and where exactly they will be carried out.

- Students walk along the banks of the stream noting where access into the water is possible.
- They should observe water flow and note areas where fast flow occurs. Are there rocks and boulders, weirs, or curves and bends where erosion or deposition is taking place?
- Students note and identify any trees which are growing along the banks. They should note any obvious plants or animal species (these include birds and insects as well as mammals and amphibians) and record in which parts of the habitat they were.
- They should look out for key environmental factors which have an impact on the stream such as slope of the stream bed and underlying geology.
- Pressures on the site that can affect it detrimentally.

On completion of this observational walk, they should pick a place with a good view of the whole area and draw a map. Particular attention should be paid to such things as the shape of the river banks, trees on the edge, bridges and fords. The test of a good map is that it can be used by a newcomer to find the exact study site.

Follow-up

On return to class there should be a discussion as to what will be studied on the next main fact-finding fieldtrip. How to measure the slope of the stream. Where in the water to look for insect life. Which abiotic factors should be measured. What about plants and trees?



Second Fieldtrip

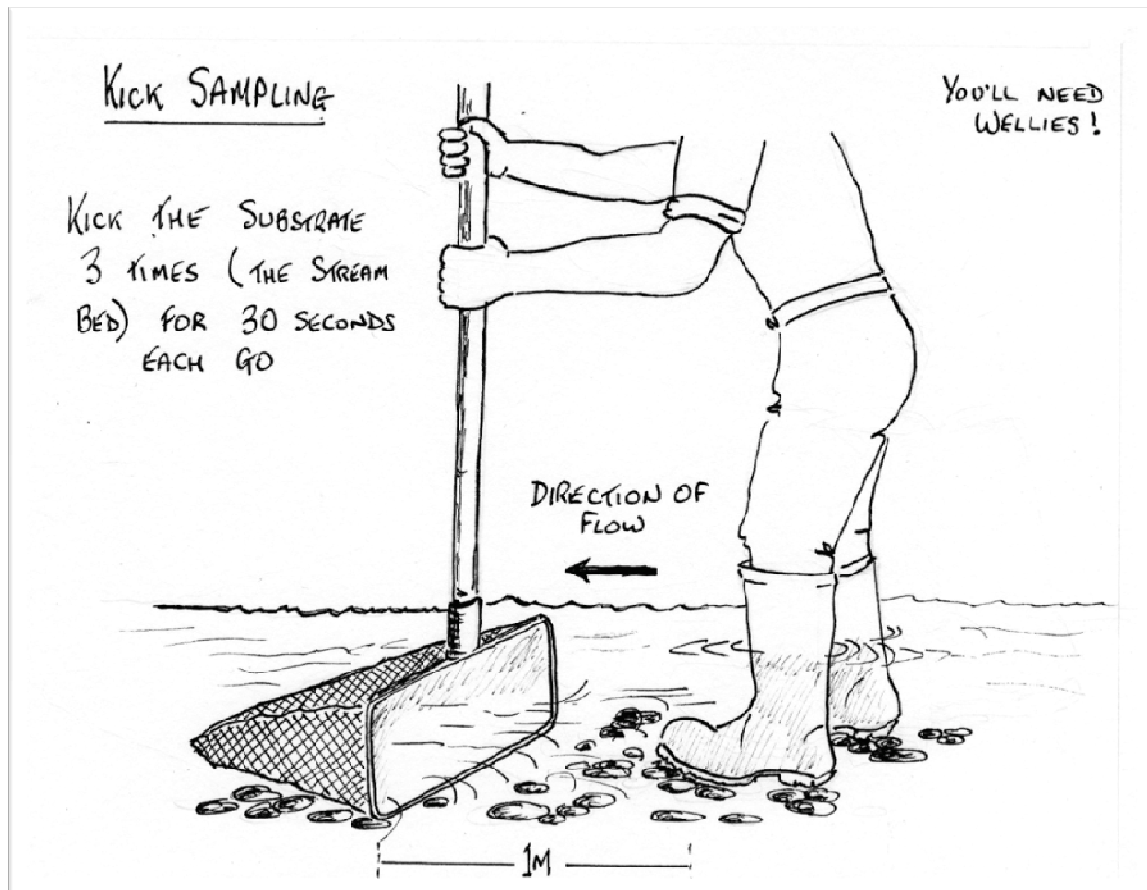
Items Needed: White buckets or trays, (catering-size mayonnaise buckets are perfect for this), clear glass jars with lids, nets, Clinometer or strings, metre sticks and spirit level to measure slope. Measuring tapes. Table tennis ball and stopwatch. pH meter. **Fieldtrip 2 Worksheet.**

Tasks

Measuring speed of the water: Mark out 10 metres along the bank. Drop the table tennis ball (or similar) into the water and measure how long it takes to float down the 10 metres.

Water examination: Half fill a clear glass jar with water. Note the colour and smell. Shake vigorously for 30 seconds and note if any bubbles remain and for how long.

Finding invertebrate species: Invertebrates can be free living in the water and caught in nets moved through the water. They can be on the bottom and can be dislodged by shuffling the gravel with your boot and holding the kick-sampling net downstream of this. They can be holding on to submerged vegetation or stones and can be collected by washing the stones into the white dishes. Empty the nets into the white dishes to observe your catch. Return all when examination is complete. Use butterfly nets to catch flying insects.



Measure the slope of the stream: This can be done more easily on the bank.

pH measurement should be carried out .

Vegetation study: A list should be made of the trees and other vegetation on the bank that are obviously affected by the stream. There is no need to sample the vegetation of the surrounding area.

Bird recording: Any passing bird should be noted. Ten minutes should be set aside to listen for bird song and particularly to note and count any birds seen. Examine larger stones for bird droppings. These could be of dipper or grey wagtails, both distinctive watercourse bird species.



Mammals: Most likely only detected by prints or droppings. Look for larger rocks (boulders) where otters often leave their distinctive droppings, which contain fish bones and scales.

Grassland Habitats

Grassland is the most common habitat in Ireland. Its value for biodiversity and wildlife entirely depends on the type of soil on which it grows, the water content of that soil and how the grassland is managed. Intensively-managed grasslands are habitats where the soil has been drained and/or fertilised. It will have been reseeded with hard-wearing or high-yielding grasses and it may be heavily grazed or closely cut for silage. Such grasslands have a low species diversity and are of little conservation interest. The least productive grasslands from a farming point of view are therefore often the most biodiverse.

Semi-natural grasslands are not intensively managed. The species that occur here will depend on whether the soil is calcareous or acid, whether it is dry and well drained or waterlogged for much of the year and whether it is mowed only once or twice a year for hay. Such habitats can range from sand dunes and machairs on dry, calcareous sandy soil, through lowland hay meadows to wet grassland on acid soil.

Such semi-natural grasslands are rare enough in Donegal but they occur in at least six Special Areas of Conservation (SACs) – mainly as sand dunes or machair.

A grassland of high conservation value will have a wide variety of different grass species. There will be many flowering plant species among the grasses. It will be home to ground-nesting birds such as skylarks, meadow pipits and cuckoos, stonechats and wheatears and in parts of Donegal still, corncrakes. Many butterfly species lay eggs on grassland plants such as meadow brown, ringlet, orange tip and common blue. Earthworms are particularly abundant in good grassland soils.

School sports pitches or heavily-managed farm grassland, while convenient for a school fieldtrip, may not have enough biodiversity to make the study worthwhile. More natural grassland should be sought out.



Fieldtrip to a Grassland

First Field Trip

Items Needed: *Fieldtrip 1 Worksheet*.

This site will have been selected as a result of mapping exercises and classroom discussion. The class will be aware of the importance of choosing as natural a grassland as possible. The aim of this first fieldtrip is to become acquainted with the site and to decide what fieldwork exercises will take place and where exactly they will be carried out.

- Students walk through the grassland noting how it is being managed.
- They should note if there is variation in the habitats – such as mowed and unmowed areas, wetter and drier areas, areas nearer the sea in the case of dunes and machairs, areas closer to hedgerows and other field boundaries. These will be noted on the Worksheet.
- They should note any obvious plants or animal species (these include birds and insects as well as mammals and amphibians) and record in which type of habitat they were.
- They should look out for key environmental factors which have an impact on the plants and animals there such as slope, availability of water and exposure.
- Pressures on the site that can affect it detrimentally.



On completion of this observational walk, they should pick a place with a good view of the whole area and draw a map. An observation frame can be used for this to get an accurate perspective. Be sure to mark in large features such as paths, gates, hedges, fences and walls. The test of a good map is that it can be used by a newcomer to find the exact study site.

Follow-up

On return to class, there should be a discussion as to what will be studied on the next main fact-finding fieldtrip. Vegetation Study – transect or quadrats. Which abiotic factors should be measured. How to find out what animal species are present.

Second Fieldtrip

Items Needed: Quadrats - ideally one per group. Tape (or ropes marked at 50 cm intervals) for transects, metre sticks, string and spirit level if measuring slope or indeed a clinometer, pH meter. Garden spade. Butterfly nets and nets to sweep vegetation. **Fieldtrip 2 Worksheet.**

Tasks

Vegetation description in each of the habitats identified. Several groups of students allocated to each of these areas. Quadrat thrown randomly three times and the plant species present listed (or described) and their abundance noted.

Transects: Line transect laid down going from one habitat type to another (say from middle to edge of field, from mowed to unmowed area or from land towards the sea) and two quadrats placed in each habitat type so that species numbers and abundance can be compared.

pH measurement: The pH of the soil should be measured for each quadrat.

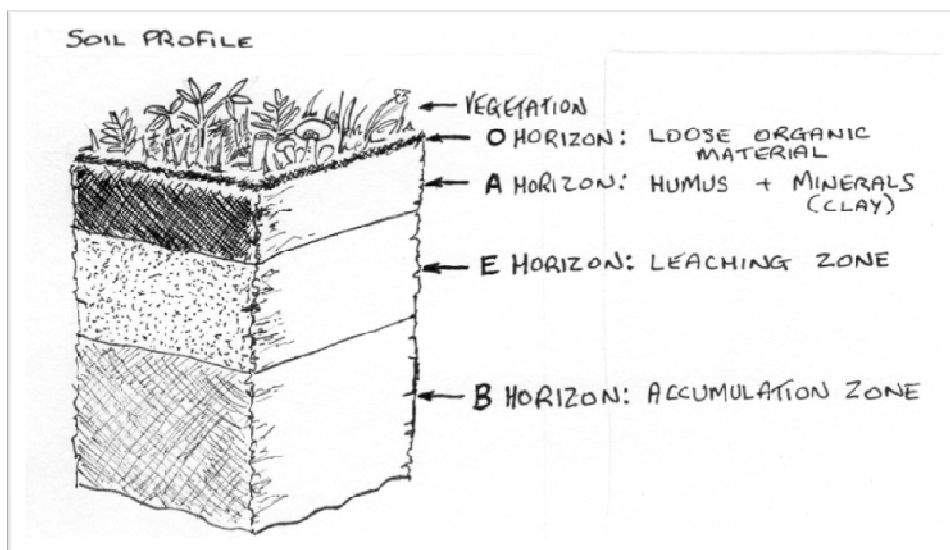
Soil examination: A sod of soil should be removed with the garden spade and examined. If the soil is sandy, the depth of the dark surface humus layer should be noted. If the soil is a waterlogged one, the distance to the water table should be measured. If it is all good topsoil, this should be noted too. Replace the sod afterwards.

Slope can be measured using metre sticks, string and spirit level or using the clinometer.

Bird recording: Any passing bird should be noted. Ten minutes should be set aside to listen for bird song and particularly to note and count any birds seen.

Mammals: Most likely only detected by prints or droppings.

Insects: Look out for flying insects or insects on vegetation and use the nets to catch a selection.

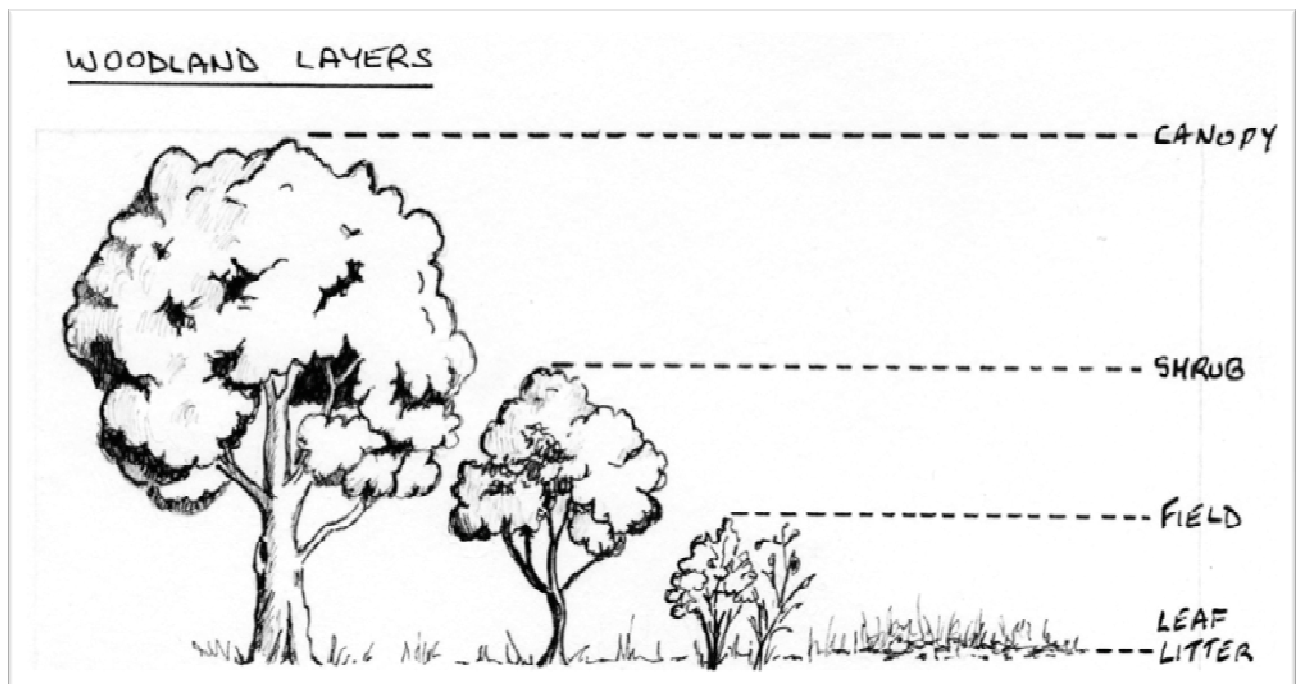


Deciduous Woodland

While Ireland's natural vegetation cover is deciduous woodland and at one time 85% of the country was covered with it, there is only 3-4% of it is left today. Together with 9% of planted coniferous woodland, this means that just over 12% of the country is forested - the lowest amount in the EU. Some of deciduous woodlands have been on the same site since the end of the last ice-age and although they have been managed and under-planted, are still considered to be semi-natural woodland and are among our most valuable habitat for wildlife. In Donegal, five deciduous woodlands are included among the Special Areas of Conservation.

The native canopy trees in deciduous woodlands are mainly ash and oak. As they do not get their leaves until May, this means that there is plenty of light on the forest floor in spring. Woodland plants flower early (such as wild garlic, anemones, wood sorrel and bluebells). Woodland birds include tree-creepers, goldcrest, long-tailed tits, jays and long eared owls. Squirrels, pine martens, wood mice, badgers and deer all belong to woodlands too. Invertebrates can be found on leaves, in the bark of trees and among the leaf litter on the ground. In autumn, woodland fungi produce fruiting bodies.

A woodland is an excellent habitat to study and there are eighteen woods listed in *Stopping by Woods* by Donal Magner for Donegal which are open all year round for public access.



Fieldtrip to a Deciduous Woodland

First Field Trip

Items Needed: *Fieldtrip 1 Worksheet.*

This site will have been selected as a result of mapping exercises and classroom discussion. The aim of this first fieldtrip is to become acquainted with the site and to decide what fieldwork exercises will take place and where exactly they will be carried out.

- Students should initially walk through the woodland, noting what habitats are there. Are all the trees deciduous? Are there areas of planted conifers. Are there open glades and rides? These will be noted on the Worksheet.
- They should make a list of all the trees they find, noting if they are broadleaved or conifer, evergreen or deciduous and identifying them if possible.
- They should note any birds they see or hear and record in which type of habitat they were.
- They should look out for key environmental factors which have an impact on the plants and animals there such as light, slope and exposure.
- Any usage of the site should be noted. For example, has any part been cut for wood?
- Pressures on the site that can affect it detrimentally.

On completion of this observational walk, they should draw a map. This can be quite difficult to do, but there may be a trail map at the start which they can use as a basis to get assistance with aspects such as shape and paths. They should at least have sketched the exploratory route they took and marked in any significant trees along the way.

Follow-up

On return to class, there should be a discussion as to what will be studied on the next main fact-finding fieldtrip. Vegetation Study – transect or quadrats. Which abiotic factors should be measured. How to find out what animal species are present.

Second Fieldtrip

Items Needed: Quadrats - ideally one per group. Tape (or ropes marked at 50 cm intervals) for transects, metre sticks. Umbrella. pH meter. Light meter. *Fieldtrip 2 Worksheet.*

Tasks

Vegetation description: There are four layers in a deciduous woodland – canopy, shrub, field and leaf litter. Pick an area where all these are in evidence and describe them.

Transects: Line transect laid down going from trunk of a large tree out to the edge of its canopy. Note the species touching or directly below the transect at every 50 cm station. Repeat this transect measuring the depth of leaf litter every 50 cm. Each group can pick a different tree and several species should be surveyed overall.

Open Glade/ Dense woodland contrast: List the species inside a quadrat thrown in each area. Each group carries this out.

pH measurement: The pH of the soil should be measured once or twice.

Light Measurement: Light readings should be taken in each of the different areas studied. You could also use the light meter in conjunction with the transect, recording light intensity levels outward from the tree.

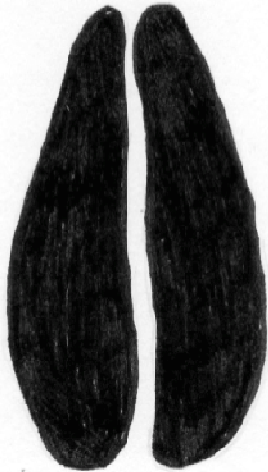
Bird recording: Any passing bird should be noted. Ten minutes should be set aside to listen for bird song and particularly to note and count any birds seen.

Mammals: Most likely only detected by burrows, digging, prints or droppings. Keep an eye out for caches of hazelnuts, especially under tree stumps.

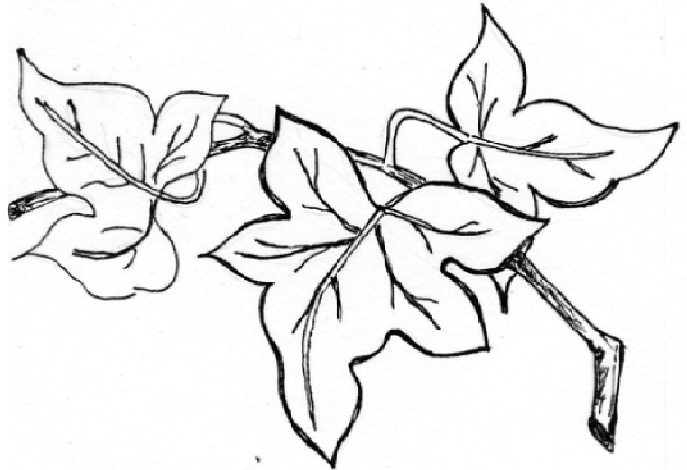
Insects: Look out for flying insects. Hold the open umbrella upside down under low trees and shake the insects from the branches into it.



DEER TRACK



IVY



HAZEL NUT



BLUE TIT

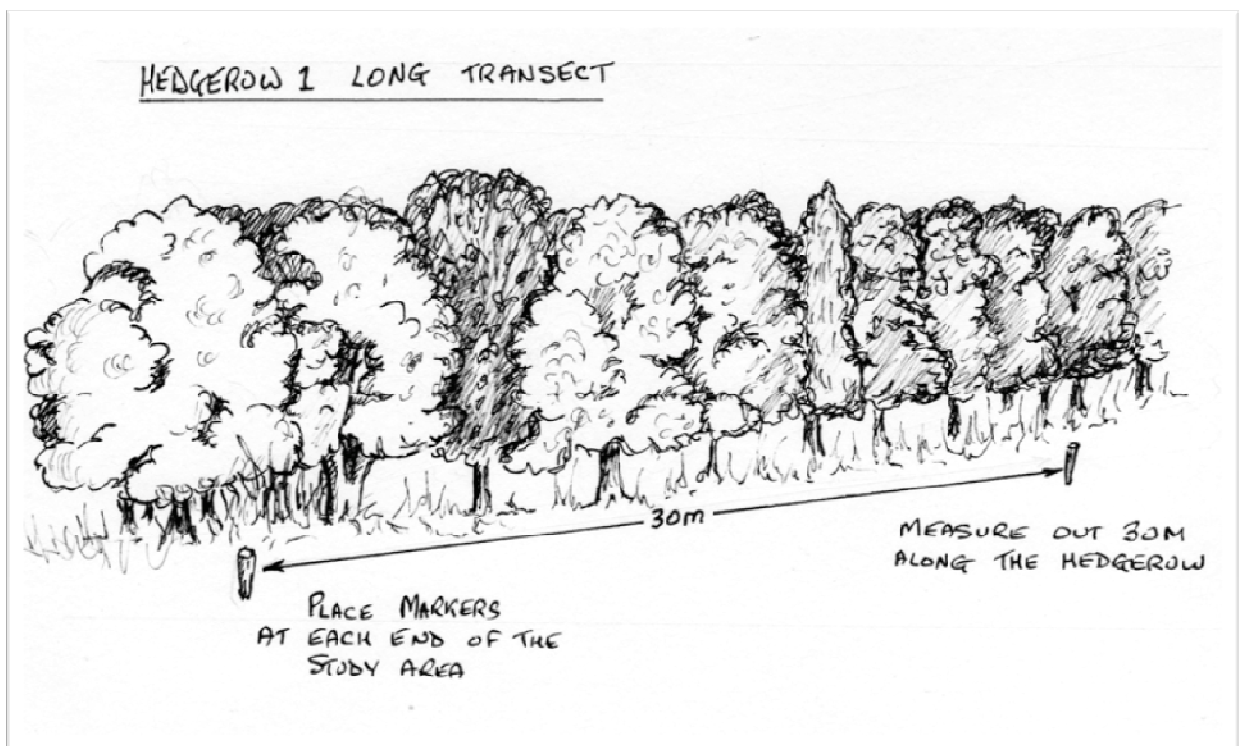


Hedgerows

Hedgerows are man-made structures which divide up and delineate ownership of land. They are rare in Europe, occurring only in Britain, Brittany, Normandy and northern Italy and they find their best expression in Ireland where they are a familiar part of the rural scene. Because we have such low broadleaf woodland cover, they are particularly important for biodiversity. Fifteen per cent of all our broadleaf trees occur here and they form very important wildlife corridors particularly in areas of intensive agriculture.

They were planted mainly in the eighteenth century and to make them stock proof, thorny trees such as hawthorn, blackthorn and holly were planted. Hedges are composed of these to this day as well as elder, hazel, ash and oak trees. Woody plants such as blackberry, wild rose, and woodbine occur while the field layer includes cow parsley, primroses, stitchwort, meadowsweet and willow-herb. They are also important fern habitat. Typical hedgerow birds are robin, thrush, blackbird, tits, wood pigeon and wren. Fox dens, badger setts and rabbit burrows are often found in hedge banks. They are full of insect life too.

While there are no hedgerows protected under wildlife legislation, they play a particularly important role in maintaining biodiversity. A visit to a hedgerow can be a very satisfactory and illuminating fieldtrip.



Fieldtrip to a Hedgerow

First Field Trip

Items Needed: *Fieldtrip 1 Worksheet.*

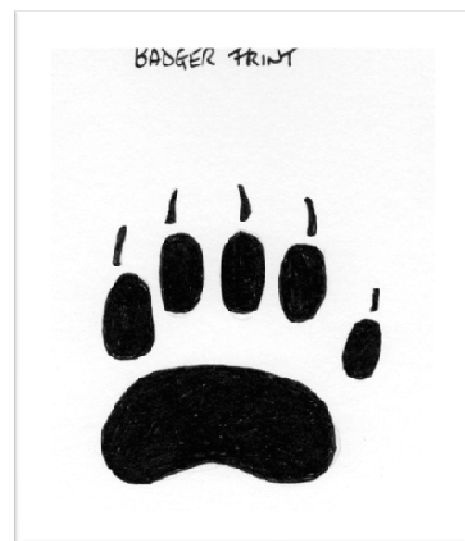
This site will have been selected as a result of mapping exercises and classroom discussion. The older the hedgerow the better so it is worthwhile looking at older maps of the area if possible to find parish boundary hedges (They'll be ones that have remained mostly unchanged for decades). The aim of this first fieldtrip is to become acquainted with the site and to decide what fieldwork exercises will take place and where exactly they will be carried out.

- Students should initially walk along the hedgerow and notice how the hedge was constructed. Is it just a line of trees and bushes? Is there a drainage ditch? Is there more than one line of trees and shrubs (making it a double ditch)?
- Student should note the variety of woody trees and shrubs in the hedge and make a list of these.
- Students should identify or describe the flowering plants growing at the foot of the hedge.
- Students should note gates and piers, particularly old blacksmiths' gates and old stone built piers reflecting the craftsmanship of earlier owners.
- They should note any birds they see or hear.
- They should look out for key environmental factors which have an impact on the plants and animals there such as orientation, light, slope, exposure, water availability and soil.
- Management of the hedge – cutting, hedge-laying and/or replanting.

On completion of this observational walk, they should draw a map. There should be a cross-section drawing to show how the hedgerow was constructed as well as a longitudinal drawing with the main trees marked in.

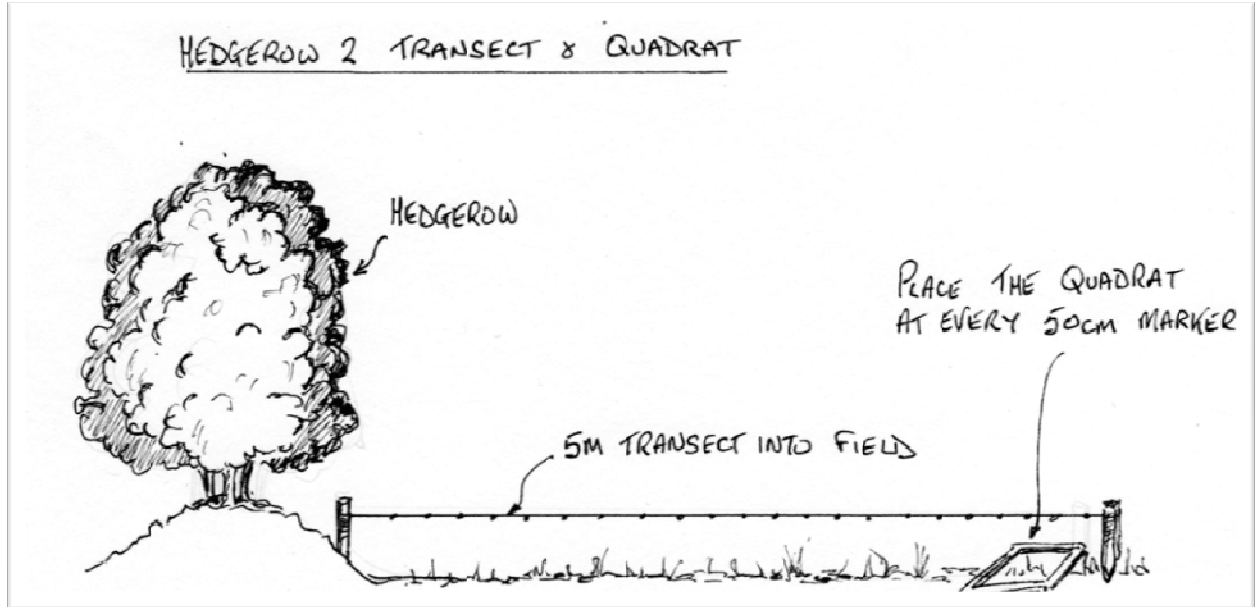
Follow-up

On return to class, there should be a discussion as to what will be studied on the next main fact-finding fieldtrip. Vegetation Study – transect or quadrats. Which abiotic factors should be measured. How to find out what animal species are present.



Second Fieldtrip

Items Needed: Quadrats - ideally one per group. Tape (or ropes marked at 50 cm intervals) for transects, metre sticks, light meter, pH meter. Butterfly nets and nets to sweep vegetation. Umbrella. **Fieldtrip 2 Worksheet.**



Tasks

Vegetation description: A line transect is laid down going from the field into the hedge and quadrats placed at intervals along this quadrat. The vegetation in each is noted.

Tree count: Thirty metres of hedge is marked out and the number of different species of woody trees and shrubs noted. This exercise should be carried out by each group along different lengths of the hedge (Six native woody species in a 30 metre length is considered to be a species-rich hedge).

pH measurement: The pH of the soil should be measured for each quadrat.

Invertebrate study: Large areas of non-woody vegetation (such as nettles) should be swept with the sweep net. Larger trees should be shaken into the upturned open umbrella.

Light Measurement: Light readings should be taken in the open area and at the base of the hedge

Bird recording: Any passing bird should be noted. Ten minutes should be set aside to listen for bird song and particularly to note and count any birds seen.

Mammals: May be detected by burrows, runs (mammal pathways) prints or droppings. Look out also for evidence of feeding such as nut-shells or gnawed tree bark.

6. What to Do with Your Results

A. Writing up Your Report

Your group is now ready to write up their work. Often the most dreaded part of a project, it need not be too long (shorter is better!) or onerous, especially if carried out as a team exercise. It is not recommended that the students split up the various sections of the report to write as these are all interconnected and it will make no sense unless all the students understand what is involved at each step. Here are the essential ingredients that your students' reports must have. This is a list worth keeping in mind if teams go off-track with the writing-up:

The report should describe:

- Where we went
- What we did
- Why we did it
- What happened
- What we can conclude from that

One piece of useful guidance might be to tell the students that they are to write the report as if it is to be read by someone who hasn't ever been to the study site and probably never will – their report thus being the only description the reader will have of the habitat.

Format & Layout

There is no prescribed format for the report but there is a conventional way of laying out and presenting scientific work. This is described here. It is recommended that your students use a word-processing package (such as Word) to create the report. It is possible to use a presentation package such as PowerPoint or Keynote but these don't have the flexibility or utility of a WP package. If the students are to make a presentation to the class or other classes, they can certainly use such a programme for this.

The report should include the hand-drawn map from the first session and if possible, an overall map indicating the study site location. There should also be some pictures (only one or two) of the site and maybe of the students at work. If possible, a sketch or two of the fieldwork equipment and techniques employed would be very useful. Do remind the students to label the drawings and to give a clear title to the photos. It is suggested that the students follow the chapter headings as set out below:

- Introduction
- Methods
- Results
- Discussion
- Conclusion

A little detail on what should go into each of these is given now:

Introduction: This sets the scene. What kind of fieldtrip we undertook and why. What kind of site we are studying. What we might hope to achieve (e.g. what we might expect from our fieldwork).

Methods: Basically, this is what we did and how we did it. It should include a description of all of the equipment, what everyone's tasks were, and how things were measured and information was recorded (e.g. how long we listened for birdsong). Here you also describe any problems or changes of plan (e.g. using a different length of transect than you'd intended).

Results: Very simply, this section shows your findings, laid out in the clearest way. See **Section B** below for suggestions on how best to display these. Note that you don't discuss or explain your results in any great detail in this part of your report. That happens in the next section.

Discussion: This section discusses the results – firstly, what we found and then why this is or may be. How do these results compare to what we might have expected? Are there any really surprising results? This section should also discuss the way the results were obtained and how this may be improved.

Conclusion: Very simply, this section summarises the Discussion section. It completes the report with a summary of the outcomes. It should be the shortest section of the report.

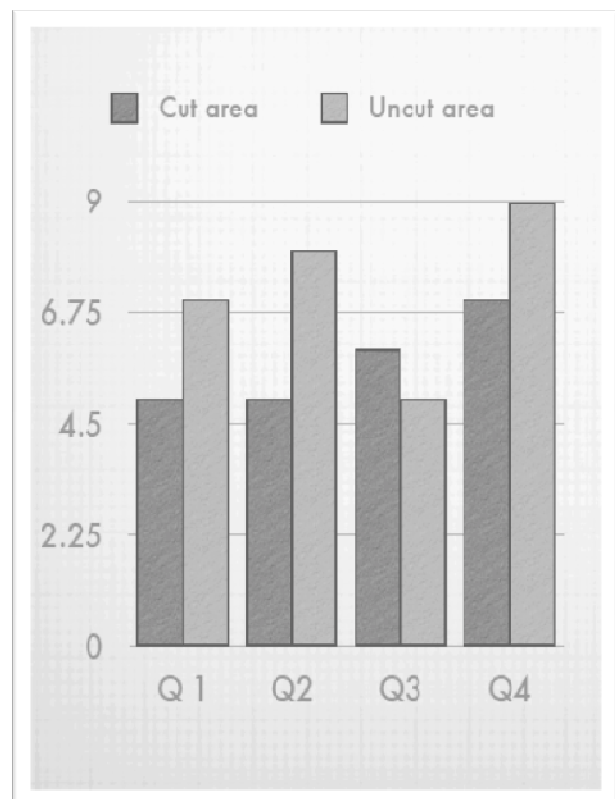
B. Your Results

You carried out transects, used quadrats and identified animal species for a reason. Displaying your results in final tables should make very clear what it was that you were measuring and why.

Quadrats

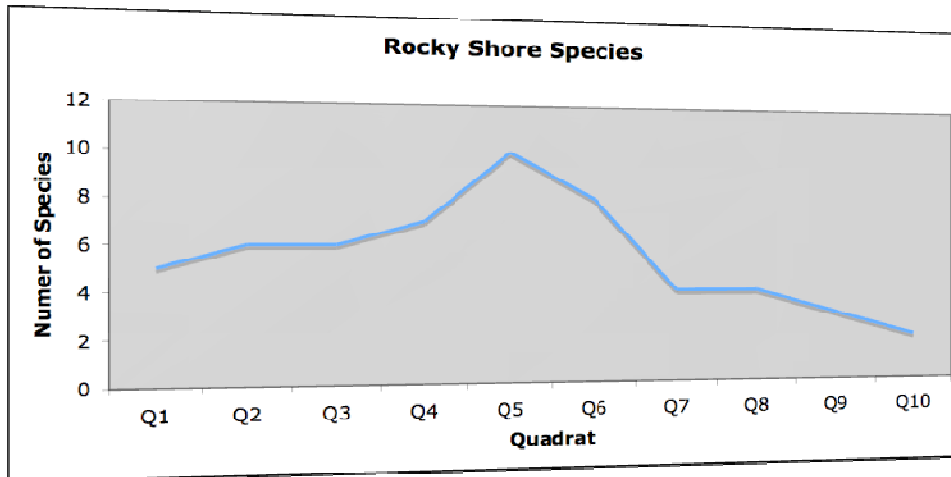
You may have been comparing two areas - such as light/shade, wet/wetter, mowed/unmowed and listing the species found. The impact of the environmental difference may be very obvious if the number of species for each quadrat is *graphed*.

Lists of plant species found for each quadrat can show which species occurred where, whether some occurred in both types or were specific to one type of environmental conditions only.



Transects

These were laid along a gradient and can show how species are affected by changing conditions. This could be along a shoreline from lower to upper shore, from a field into a hedgerow, or from wet to dry on a bog. You may have done a slope transect as well so the results could be shown together – such as how species numbers increase/decrease as the ground level changes, and which part of the transect each species inhabits. You may also have pH figures or light readings for each station as well so these can be incorporated into the graph.



Animal Species

It is more difficult to analyse animal species on the basis of one or two visits at the same time of year so generally animal results are given as lists of species seen. However visits made to seashores at different tides could produce two lists of different bird species, as could visits made at completely different times of year, say spring and autumn to land habitats.

Freshwater Invertebrate Species

If your fieldtrip has been to a fast-flowing stream, one of the aims of your work is to establish the quality of the water. To this end, you will have identified the invertebrate species you found in the water. Some of these will be indicator species of water quality so by filling in the table below you will be able to ascertain what are the most sensitive species present and thus what is the quality rating of your stream.

This following table is from the resource pack '*Something Fishy*' and shows the bugs most likely to be found in streams of various water quality. The relative abundance of these bugs will allow you to determine whether the water is of poor, good or very good quality.

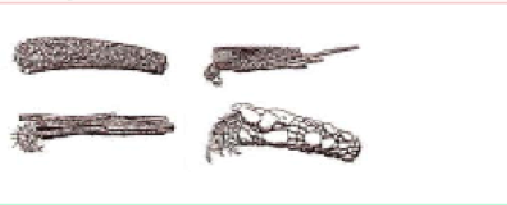


Using tables and graphs such as those shown in this section, you will be able to discuss what your habitat is like and how environmental factors affect it.

Water Pollution Test Kit

Record the number of each insect

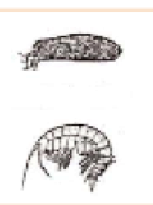



Very Good Water

Extremely Sensitive to Pollution

<p>Cased Caddis</p> 	<p>Stonefly</p>  <p>Olive Mayfly</p> 
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Good Water

Less Sensitive to Water Pollution

<p>Cased Caddis</p> 	<p>Beetles</p> 
<p>Shrimp</p> 	<p>Mussels</p> 

Poor Water

Pollution Tolerant

<p>Midge Larvae</p> 	<p>Worm</p> 
<p>Hog-louse</p> 	<p>Leeches</p> 

7. Where to Find More Information

The idea of leading a fieldtrip where natural heritage is involved is daunting for many teachers. Most of this is based on a wariness around the identification of species, rather than on a lack of understanding of the key principles. Fortunately for teachers, there are now many user-friendly aids that can be drawn upon, and a great deal of these are free and available online. This section lists what the authors feel are the best of these. Arguably more dependable and reliable though, are printed resources which have endured the scrutiny of editors as well as peers in the various aspects natural heritage and passed. Many of these are relatively low-cost and will not go out-of-date at any time soon. The most relevant and gettable are listed below. Our most strenuous recommendation of this section however, is to seek out expert advice. To this end, we list various organisations that will be able to help you out with your queries.

Resources in Print

Boglands: *A Day on the Bog - Field Studies Guide* (1994). Irish Peatland Conservation Council, Bog of Allen Nature Centre, Lullymore, Rathangan, County Kildare. Can be ordered from the IPCC by calling them on (045) 860 133 or visit www.ipcc.ie. Cost €10. This is a very practical and well-written guide which assumes little or no knowledge on the reader's behalf. Designed to assist you in undertaking fieldtrips.

Woodlands: The IPCC also stock a *Wild Woods of Ireland - Field Studies Guide*. This is also €10 and is available at the above address.

Stopping by Woods - A Guide to the Forests and Woodlands of Ireland (2011) by Donal Magner. Published by Lilliput Press, cost €25. This is the best guide to woodland sites that may be visited in Ireland and is highly recommended. Available in bookshops or from www.treecouncil.ie

Seashore: *A Beginner's Guide to Ireland's Seashore* by Sherkin Island Marine Station (1999). This excellent little guide is perfect for seashore beginners and students. The living things described are colour-coded for quick reference. Cost around €7 from Sherkin Island Marine Station, County Cork or online at www.sherkinmarine.ie. It can be found in some bookshops.

Shore Birds of Ireland by Jim Wilson and Mark Carmody (2009) is a beautifully illustrated and interesting book (even for non bird-lovers) and contains very useful information on the shoreline habitats. RRP €15.99, in bookshops or from The Collins Press.

Grasslands: John Feehan, Helen Sheridan and Damian Egan recently produced a truly beautiful book on Irish grasses. *The Grasses of Ireland* is very detailed and full of useful information. €37.50 from Teagasc, call (059) 917 0200 or visit www.teagasc.ie/publications

Wildflowers: A good beginner's book is *Collins Complete Guide to British Wildflowers* by Paul Sterry. It's not really complete but does have good photos of the more common species you are likely to come across. It's around €20 from bookshops. It is recommended that if you are interested in wildflower identification that you seek out some of the older Collins wildflower guides which have painted rather than photographic illustrations.

Zoe Devlin - an amateur botanist and photographer produced *The Wildflowers of Ireland - A Field Guide* (2014) which is a very user-friendly guide that features 530 plants. It will be available from The Collins Press for €14.99. Look also on www.biology.ie.

Trees: The *Collins Tree Guide* by Owen Johnson is far and away the best guide for tree identification. It costs around €14 in paperback and is still to be found in bookshops as well as on Amazon.com and sites such as www.nhbs.com.

The Tree Council of Ireland have tree identification kits for 24 of our most common trees, they cost €5 from www.treecouncil.ie.

Identifying Species: There is nothing to match the series of guides produced by the UK Field Studies Council. These are beautifully illustrated and designed for beginners. There are around a hundred of these available and are highly recommended. Some, like the freshwater invertebrates guide (*Freshwater Name Trail*) work with a simple key but all work with illustrations that are very accurate and appealing. There are guides for all habitats you might be studying. They cost around €5-7 and are available from www.ipcc.ie.

To know what species are to be found in Donegal, look up the *Biodiversity Species List for County Donegal* (2009). *Gaia Associates & Donegal County Council*. This can be obtained from the Heritage section of the Donegal County Council website (www.donegalcoco.ie/heritage).

Habitats: *A Guide to Habitats in Ireland* by Julie Fossitt is the widely accepted 'bible' of Irish habitats. Although listed last here, this little book is very useful indeed. It describes just about every habitat you're likely to come across in Ireland and gives you examples of species likely to be found there. Some of the book is technical but it is mostly very straightforward. You can download it as a PDF for free from www.heritagecouncil.ie.

Online Resources

Wildflowers: The above-mentioned Zoe Devlin has created a fantastic resource at www.wildflowersofireland.net. This website has excellent pictures on hundreds of wild plants which can be searched by name, colour, flowering time and family as well as background information on most common species. Another lovely site is www.irishwildflowers.ie which also allows you to see typical plants of certain habitats as well as featuring maps of where the plants have been recorded.

Trees: There are many interactive online tree identification keys, some of which are excellent (such as that from the British Natural History Museum www.nhm.ac.uk) but these are usually of little use when you are out in the woods or fields and you'll wish you had an old book. However, they are good fun to work through with a group. One drawback is that most are British and can contain tree species we don't have, making them inaccurate.

You'll find many sites offering help with identification, though. The Irish Natural Forestry Foundation has a handy leaf guide. The Northern Ireland Fungus Group has a useful online interactive key of winter twigs.

Our Trees by the Tree Council of Ireland (2000) is an excellent publication. Not so much an identification guide as a trove of background information and lore on native trees. Not least is the unmatched guide to seed collection, preparation and planting which every school should have. It is not in print but is available as a PDF from their website www.treecouncil.ie or from www.woodlandsofireland.com.

Streams and other Freshwater Habitats: *Something Fishy: an Education Resource Pack* is a really useful project resource for streams, rivers and wet habitats. This was produced by the Central Fisheries Board with Blackrock & Monaghan Education Centres. You can find it at: www.somethingfishy.ie

Boglands: Information on bogland conservation is to be found on www.ipcc.ie. Information on Irish wildlife is on www.iwt.ie. Some general wildlife and biology resources, including some monitoring projects can be found at www.biology.ie. Lots of information on Irish birds, including great photos are on www.birdwatchireland.ie. The Royal Society for the Protection of Birds (RSPB) also has an excellent bird site at www.rspb.co.uk.

County and National Organisations

The National Parks & Wildlife Service (NPWS) should be your first port of call. Details of their contacts for Donegal and nationally are given in Section 4. Their website www.npws.ie is very useful. Do try and make contact with your local conservation ranger.

The County Donegal Heritage Office, Donegal County Council will be able to advise you on important sites and habitats in the county.

Inland Fisheries Ireland has responsibility for the well-being of our fisheries and as such have great expertise and knowledge when it comes to streams and rivers. Their Dublin office (01 - 884 2600) will be able to tell you your local Fisheries Officer.

Non-Governmental Organisations

BirdWatch Ireland has the greatest resources in terms of staff, volunteers and knowledge of any Irish environmental organisation. They will probably be able to give you sound advice on any aspect of bird habitats and conservation (where and when to see birds, for example). Look them up on www.birdwatchireland.ie or call on (01) 281 9878.

Irish Wildlife Trust: This national NGO has a number of experts who may be able to advise you on where to visit and when. They may also give advice on what resources might be available. They manage a number of wildlife reserves. They are at www.iwt.ie or call on (01) 860 2839 or e-mail enquiries@iwt.ie

An Taisce: Our national heritage organisation has a natural heritage officer who will be able to advise on important habitats and sites in your area. They own some nature reserves (including two in County Donegal) and manage others. Contact them at (01) 454 1786 or e-mail info@antaisce.org.



Appendix A

Questionnaire Survey

Appendix B

Worksheets

- **Fieldtrip 1** (*For use in all Habitats*)
- **Boglands**
- **Coastal Habitats / Rocky Shore**
- **Freshwater Habitats / Shallow Stream**
- **Grassland Habitats**
- **Deciduous Woodland**
- **Hedgerows**

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