

Killiney Hill

Biodiversity Education Programme

An action of Dún Laoghaire-Rathdown Biodiversity Plan 2009-2013



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Design and production: **Concept 2 Print**

Illustrations: **Naomi Mc Bride**

Content: **Irish Wildlife Trust**

Editing: **Dún Laoghaire-Rathdown County Council**

Proofreading: **Therese Carrick**

Biodiversity includes all living things from the tiniest micro-organisms to the largest whales in the sea. The relationship between plants and animals and their surroundings create the environment in which we live, and they are an essential component of our daily lives.

With the dazzling technology and busy nature of modern life it is easy to become disconnected from nature and to lose sight of how heavily we rely on our natural environment. We forget that trees and other plants provide us with oxygen, food, fuel, medicines and much, much more! Playing and relaxing in natural surroundings benefits our health and contributes to a greater sense of wellbeing.

Our parks and wild areas provide us with the space to play and have fun. These areas also provide homes and habitats for biodiversity. It is important that we share these places with biodiversity and allow space for wild plants and animals to live and thrive.

The Dún Laoghaire-Rathdown Biodiversity Education Programme is intended to increase children's awareness of the local environment, encouraging them to learn about and experience nature in stimulating and creative ways. It provides children, teachers and youth leaders with the opportunities and the tools to explore their local parks and green spaces as well as fostering a greater appreciation for these areas and the wildlife they support.

I would like to take this opportunity to thank Heritage Council for supporting the development of our Biodiversity Education Programme. I would also like to say a big thank you to everyone who provided advice and support during its preparation including the Irish Wildlife Trust, Blackrock Education Centre and Airfield Trust.

Mary Toomey, Biodiversity Officer
Dún Laoghaire-Rathdown County Council

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Dun Laoghaire Rathdown County Council (DLRCC) commissioned The Irish Wildlife Trust to develop a biodiversity education programme for Killiney Hill to be used by primary schools and community/youth groups in the area. This is an action of the DLRCC Biodiversity Plan. This programme enables teachers to fulfil practical elements of the school curriculum whilst getting active in the beautiful Killiney Hill surroundings. The pack comprises a self-guided handbook which links activities to the habitat types of Killiney Hill.

Aim of the project

The aim of the Killiney Hill Biodiversity Education Programme is to highlight the value of and to promote the use and care of biodiversity in the local area through learning exercises and activities taking place on Killiney Hill. We hope to heighten awareness of the value of green space and wildlife within the DLRCC area. We hope that this handbook will provide a useful resource to teachers and community/group leaders by fulfilling elements of the curriculum and encouraging regular visits to Killiney Hill.

How to use the biodiversity pack

This handbook includes a series of teachers' notes and student activity sheets that provide useful information and guidance on investigating wildlife in Killiney Hill. The first two sections of the pack contain a map and nature trail for Killiney Hill which includes background information about the site and the various trail stops. The map is provided to guide you to the different habitats and viewing points.

The next section of the pack explains the concept of biodiversity and provides some useful information and facts about it.

The teachers' instructions in section 5 include background information, instructions and a list of materials for all student activities.

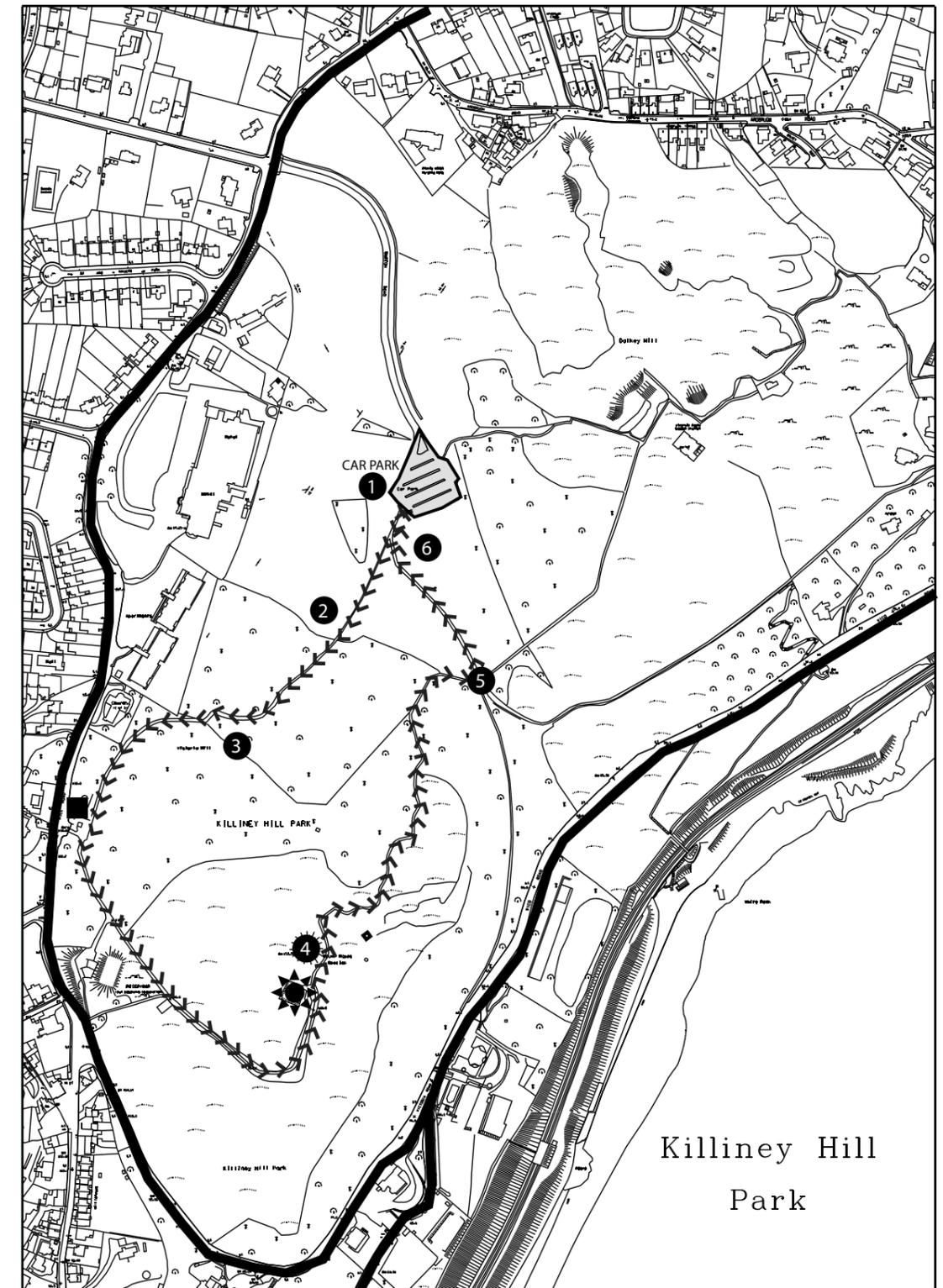
Section 6 comprises student activity sheets, which contain exercises and activities designed to encourage students to actively explore and learn about nature.

The youth and community activities in section 7 outline fun games and activities for all.

Section 8 lists useful field guides, books and websites that can be used for your field trips to help identify species of plants and animals.

Outdoor safety guidelines are provided in section 9 and should be consulted before each trip to minimise potential risks to programme participants.

Lastly, a checklist is provided which links each activity to relevant topics in the primary school curriculum.



This nature trail is a looped trail that begins and ends in the car park. Passing through the southern half of the park, the trail encompasses a number of different and contrasting habitats such as grassland, scrub, broadleaf and coniferous woodland. As you pass through these different habitats, observe how the dominant plant species change, and keep an eye and an ear out for the many species of animal that live in this beautiful parkland. You might even catch a glimpse of our native Red Squirrel. Other things to look forward to are the panoramic views from the top of the hill and interesting historical features such as the Killiney Hill Obelisk.

1. Grassland

The trail begins from the Killiney Hill car park, which is within the park and can be accessed from Dalkey Avenue. There is a large expanse of grassland in this area, to the west of the car park and along the road. To begin our nature trail we will explore this grassland, and investigate the plant and animal life found in this bright and open habitat.

From the car park, move into the adjacent grassland to get a closer look at what's there. You will have noticed that the grass is kept short and neat through regular mowing. Due to this style of intensive management, you will not find a huge variety of species here; if grass is left to grow longer and develop into a meadow a greater variety of grasses and wildflowers can grow but there is always some diversity to be found if you look hard enough! So wander round the grass keeping an eye out for common species of flowers like Dandelion, Daisy and Buttercup.

Despite the lack of diversity in intensively managed grassland, some animals still make use of this habitat. Open grassland is a good place to look out for birds because they are clearly visible in the short grass. Look around the grassland now and see if you can spot any birds. Look out for common species such as Rook, Blackbird or thrushes. The Mistle Thrush and Song Thrush look very similar, but the Mistle Thrush is bigger and bolder. Both species often hop around on lawns busily searching in the grass. What are they searching for? you may ask, and the answer is probably right under your feet – Earthworms! These slippery little creatures are an essential part of any grassland ecosystem; right now they're tunnelling through the soil just under the grass, breaking down organic matter and helping aerate the soil with their network of tunnels. You might not fancy eating Earthworms yourself but birds and other animals love them.



Song Thrush

At night when the birds take a break from their worm hunt, other animals come out to take over. Most Irish mammals are nocturnal, meaning they only come out after dark and two of our biggest mammal species are worm hunters, namely the Fox and the Badger. Worms make up part of the diet of both these creatures. Keep an eye out for patches of grass that have been torn up to expose the roots, this is done by Badgers and Foxes while searching for worms and grubs.

Return to the car park to pick up the trail.

2. Wildflower meadow

At the end of the car park opposite the entrance, a footpath begins, marked in red on the map. Follow this footpath out of the car park, and take the right fork just ahead. This leads past a small stand of tall conifer trees on the right hand side. Once the path has passed beyond the conifer trees, you can see a small patch of grassland to the right that has been converted into a wildflower meadow, this is stop 2. Make your way to the meadow to observe the variety of plant species found there.

Here in the wildflower meadow, we can observe how different management strategies create different habitats; this was converted from grassland to meadow in June 2009. This is a planted meadow but one can create a meadow by simply changing the mowing regime. By cutting the grass only a few times a year and by not applying any chemicals (such as fertiliser or pesticides), the grass grows long and has a chance to flower. Over time local wildflower species will appear. This in turn will attract insects, birds and mammals. So changing something simple like the number of times you cut the grass each year can radically change a habitat and its wildlife value.



Wildflower Meadow

3. Deciduous woodland

Return to the path and continue gently uphill into the woods in front of you. This woodland is made up of *broadleaf* trees; trees with soft flat wide leaves rather than the needle-like "pine" leaves on *conifer trees*. Look out for the different species of tree in this woodland. You should be able to spot native Irish tree species like Oak and Ash and non-native Sycamore and Horse Chestnut. *Native species* are species that occur naturally in Ireland, while *non-native species* are species that have been introduced by man. Ireland was once largely covered in native Irish broadleaf woodland, comprising mostly of Oak, Ash and Hazel. However, there is very little of such woodland left today. The ancient original forest of Ireland can never be replaced but planted native broadleaf woodland is the next best thing.



Oak



Birch



Horse Chestnut



Ash

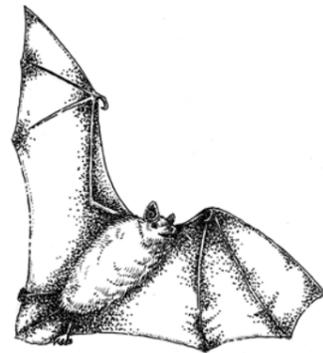


Sycamore

As you walk this section of the path, take note of the structure of this woodland, the trees may be the dominant feature but there are other plants here too. The smaller plants growing closer to the forest floor make up what is known as the *understorey* and the *herb layer*. In a typical Irish broadleaf woodland, you can expect to find species such as Holly, Hazel, Bramble and Bilberry in the understorey and grasses and wildflowers in the herb layer. These layers are an important part of the woodland ecosystem; a broadleaf woodland with a healthy understorey can support a greater diversity of animal life.

Broadleaf woodlands such as this support many native species of bird which use the trees and the understory for food and shelter. **Can you think of one plant that might provide food for a bird or one place it might find shelter in a woodland like this?** As you pass through the woodland listen for the sound of bird call. If you stop, stand still and face toward the sound you may well see one of our woodland birds in the trees or understory. Some woodland species you can expect to see or hear are the Great Tit, Wren, Blue Tit, Chaffinch, Tree Creeper and Jay. The Jay is a beautifully coloured woodland bird with pinkish orange and grey plumage and a blue patch on its wings. It is a relative of the Magpie and is similar in size and shape but unlike the Magpie, it is shy and secretive. Spotting one of these beautiful birds is always a wonderful occasion.

Continue through the wood till you reach an open area with a bronze statue (of Daedalus a character from Greek mythology). Here the path opens onto the road, and you will find a large old stone gate with a stone gate lodge beside it. The lodge was built in 1740 as a keeper's house when the park lands were part of the estate of Killiney Castle (now Fitzpatrick's Castle Hotel). Not only do old stone buildings like this remind us of our local history but they are also excellent places for Bats to roost. Bats need a dark, sheltered and safe place to roost during the day. They often use the roof space of old buildings for roosting as well as holes and crevices in walls, bridges and mature trees. Three species of Bat have been recorded in the park, the Common Pipistrelle, Soprano Pipistrelle and Leisler's Bat. **Since Bats like to roost in old buildings and mature old trees, can you think of any problems they might have today?** (Modern buildings are often so well sealed, they lack access points for Bats).



Common Pipistrelle

As you continue up the path, the forest will give way to scrub habitat and the first views south to the Dublin and Wicklow Mountains will appear on the right hand side.

4. Obelisk area

Scrub is a habitat type that is not dominated by trees but by smaller "shrub plants", small woody species. Here, the scrub is dominated by Gorse. Gorse is common in Ireland and is recognised by its very spiky leaves and its yellow flowers. As you move out of the forest into the scrub habitat, the path steepens and continues uphill. A viewing area on the right provides views down the coast and inland to the mountains. Can you name any of these mountains? (Sugar Loaf).



Killiney Obelisk

Continuing past this viewing point, the path leads to an open, grassy area at the top of the hill. Upon reaching this area, a tall tower with a cone shaped roof is immediately obvious, this is the Obelisk and marks the highest point in the park at 170m. From this area, there are panoramic views in all directions. Take some time to walk around the hilltop and take in the fantastic views of the local landscape. To the south you can see the south Dublin coastline stretching down to Bray Head, with the Wicklow Mountains visible beyond, while the Dublin Mountains and Dublin city can be seen to the West and North. Looking east onto the Irish Sea on a clear day, Wales can be seen. It is also a great place for spotting marine mammals. Harbour Porpoises and Seals are often visible if you look hard enough.

Walking around the grassy area in front of the Obelisk, a number of granite outcrops can be seen protruding from the ground. **What do the granite outcrops tell you about Killiney Hill?** Killiney Hill was formed when domes of magma were pushed toward the Earth's surface and cooled slowly underground to form granite. This same process was involved in the creation of the Dublin and Wicklow Mountain Chain.

Now follow the path leading away from the Obelisk straight past a small pyramid on the right and downhill.

5. Stonewall habitat

You are now walking on a narrow path downhill through woodland; as you wind your way through this woodland look out for ferns and moss. The shady, sheltered conditions of a forest floor are perfect for these plants. Some ferns even grow on the branches of trees and are called *epiphytes*.

This path leads to a crossroad with two pillars and an old stonewall. Stop here to see what life you can find living on and in the cracks of this wall. Mosses and ferns often grow on old stonewalls but you will also find another interesting form of life here, lichens. Lichens are found growing on many surfaces such as trees, rock, walls and gravestones. Lichens are composed of two types of organism that live together benefiting from each other. This is called a "*symbiotic relationship*"; the two organisms that make up lichen are fungi and algae. Lichens can be used as pollution indicators for air quality. Only certain types of lichen can survive in areas without clean air, as lichens are not generally tolerant to pollution.

To continue on our trail toward stop 6, take the left at this crossroad.

6. Coniferous woodland

Walking away from the crossroad, the path leads out of the woods and into the last stretch of our trail. Here the path skirts along the edge of coniferous woodland on the right with grassland running along the left. **Examine this woodland as you walk alongside it. Is it different to the woodland at stop 3?** This woodland has a very sparse understory. (The dense canopy cover blocks the light that plants need to grow leading to very sparse understory and herb layers).

Along the edge of the path a Larch tree can be found. The Larch tree is a coniferous tree, like the other coniferous trees here it has pine needles and cones, but unlike them, it loses all its pine needles in winter and becomes bare, like an Oak, Ash or Birch. This is because it is *deciduous*, meaning it loses its leaves with the change of the seasons; trees that keep leaves all year round are known as *evergreens*.



Larch
(Conifer)



Scots Pine
(Conifer)



Oak
(Broadleaf)

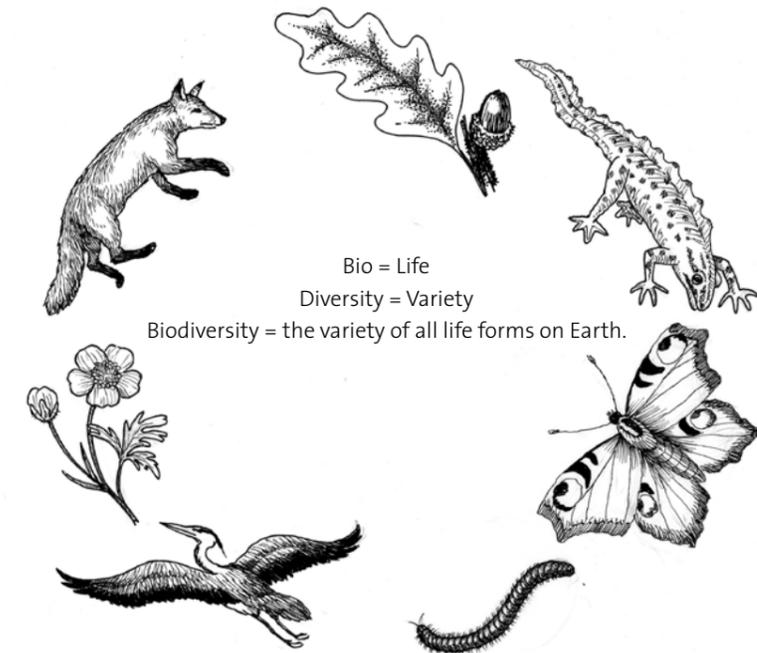
Here at the coniferous woods is your best chance of seeing the Red Squirrel. Red Squirrels are known to be living here in Killiney Hill, and are often found in coniferous woodlands because they are avoided by the introduced Grey Squirrel which is larger and out-competes them. Red Squirrels are a native Irish species and unfortunately they are in decline, meaning their numbers are dropping and their range is decreasing. If you don't see them, you can always look for evidence of their presence. You could look for the remains of pine cones that have been eaten by squirrels. Continuing on this path will shortly lead you back to the car park where our trail began. Hope you enjoyed it.



Pinecone fed on by squirrel.

Finish back at the car park

WHAT IS BIODIVERSITY?



Our life forms can vary from the tiniest bacteria and bugs to humans up to the biggest whales in the sea.

WHY BIODIVERSITY IS IMPORTANT:

Biodiversity is our **life support system**.
Ecosystems regulate **climatic processes**.
Animals and plants breakdown waste and **recycle nutrients**.
Animals and plants filter and **clean water**.

Natural habitats buffer against **flooding**.
Ecosystem services maintain **soil fertility**.
Biodiversity provides **natural resources**.
Biodiversity provides essential **medicines**.

BIODIVERSITY LOSS:

- Biodiversity is currently being lost at an unprecedented rate globally, and Ireland is no exception.
- Scientists estimate that species extinctions are occurring **100 to 1000 times faster** than without human influence.
- Without a change in our actions, half of the world's species may be lost by 2100.

SOME OF OUR NATIONALLY THREATENED SPECIES:

- Kerry Slug.
- Lesser Horseshoe Bat.
- Natterjack Toad.
- Otter.
- Pearl Mussel.
- Red Squirrel.
- Salmon.

CAUSES OF BIODIVERSITY LOSS:

- Habitat destruction.
- Water pollution.
- Unsustainable consumption.
- Climate change.
- Invasive alien species.

PROTECTING BIODIVERSITY LOCALLY AND GLOBALLY:

- Change consumption patterns,
- Buy local, and seasonal produce where possible.
- Do not buy peat based gardening products.
- Do not use slug pellets, as they not only kill slugs but the birds that eat them too.
- Reduce your energy consumption as climate change and biodiversity concerns are inextricably linked.

5.1 Getting started

- Step 1:** Read the introduction/ nature trail booklet to Killiney Hill as provided.
- Step 2:** Prepare for the activities outlined in activity sheets 1-4 in the classroom.
- Step 3:** During the visit to Killiney Hill, you can pick and choose which activities you would like to concentrate on.

The following are teachers' notes for activity sheets 1-4.

These activities are designed to introduce each student to the programme and to Killiney Hill.

Activity 1. "Making a Nature Diary" will provide a catalogue of what the students have discovered and studied. It can be used as a reference notebook for the different words and skills that are introduced to them. All good ecologists have their notebooks to describe, illustrate and catalogue their findings in the field. The Nature Diary is a good way of keeping all of the students' discoveries in one notebook.

Activity 2. Journey to Killiney.

Activity 3. Making a map.

Activity 4. Be a Killiney explorer.

5.2 Grasslands

The following are teachers' notes for activity sheets 5 and 6 and are applicable to trail stops 1 and 2.

Background information for activity sheets 5 - Be a grassland detective

Grasslands are characterised as lands dominated by grasses rather than large shrubs or trees. There are different types of grasslands, some are like garden lawns and mown many times throughout the year but others may be only mown once or twice allowing for a greater number of different plants and animals to live in them. To find out what plants live in the grasslands in Killiney Hill, you will need to spend some time examining a small area very closely with a quadrat. A quadrat is a square frame that you place on the ground to look at the plants living within the square. It is usually a half metre square. Use a Wildflower Field Guide to help you, available from your local library.

Common grass and herb species that are tolerant of mowing are Annual Meadow Grass, Rye Grass and White Clover. Other species that can be present include Red Fescue, Creeping Bent, Dandelion, Plantain, Daisy and sometimes Shepherd's Purse.

You will need:

- A pencil and notebook.
- A half metre square frame or quadrat.
- A magnifying glass (if available).
- A camera (if available).
- A Wildflower field guide.

Limitation: This activity is more suited to Spring, Summer and early Autumn and may not be suitable in Winter when it is more difficult to identify species.

What to do:

1. Depending on how many quadrats or frames you may have, divide the students into groups. Choose a nice grassy area at stop 1 where the area looks managed, e.g. the grass is cut short. At stop 2, you could choose a grassy verge area that has been let grow long.
2. One student must randomly throw the quadrat behind their shoulder so that the site they will study is randomly chosen.
3. Use the Wildflower Field Guide to identify the plants you find in the quadrat. They can record their findings on activity sheet 5. Make drawings or take pictures of the plants you cannot identify.

4. Throw the quadrat three times, so you get to look at three different areas in the grassland.
5. On the activity sheet, the students are asked questions about the amount of different species of plants found so they can establish which plant species is dominant in the grassland habitat.
6. When the students are back in class, make a checklist of grassland plants. Organise a class discussion on the plants you have discovered, considering the time of year and the type of area you studied.
7. This activity can be repeated in different types of grassland and a comparison can be made regarding grassland management by Dun Laoghaire Rathdown County Council Staff and their mowing regimes. When grass grows tall, a greater the amount of wildlife can normally be found.

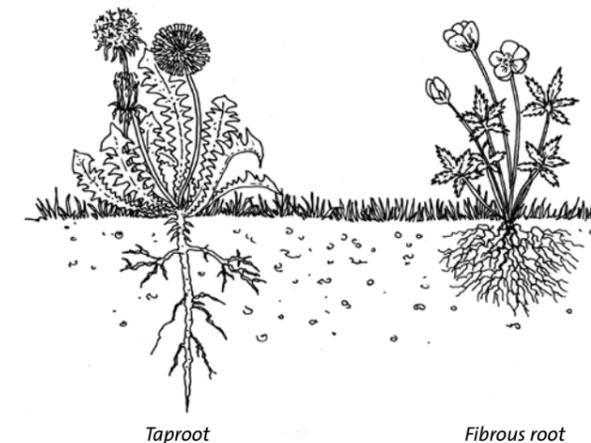
Background information for activity sheets 6 – Identify parts of a plant

This activity familiarises the student with the different plant parts and their functions.

Basic parts of most plants:

Plant parts - roots

The roots help provide support by anchoring the plant and absorbing water and nutrients from the soil which is needed for growth. Plants can have either a taproot system (such as Dandelion), or a fibrous root system (such as Buttercup).



Plant parts - stem

Stems carry water and nutrients from the roots to the leaves. The food produced by the leaves is then transported to other parts of the plant. The cells that do this work are called the xylem (pronounced zylem), and phloem (pronounced floam) cells. Xylem cells transport water and nutrients absorbed from the soil. Phloem cells transport food made in the leaves to other areas of the plant. Stems also provide support for the plant allowing the leaves to reach the sunlight that they need to produce food.

Plant parts - leaves

Leaves are the food making factories of green plants and use a process called *photosynthesis* to make food. In this process, carbon dioxide and water in the presence of chlorophyll (the green pigment in the plant) and light energy are changed into glucose (a sugar) and oxygen. This energy rich sugar is the food used by most plants. Photosynthesis is unique to green plants and supplies food for the plant and oxygen for other forms of life, like people. A green plant helped create the oxygen you are breathing today.

Leaves have evolved to catch light and have openings to allow the exchange of water and air with the atmosphere. The outer surface of the leaf has a waxy coating called a *cuticle*, which protects the leaf. Veins within the leaf transport water and nutrients.

Leaves come in many different shapes and sizes. Leaves can be *simple* with a single leaf blade connected by a petiole to the stem, e.g. Oak leaf, or they may be *compound* and made up of separate leaflets attached by a petiole to the stem, e.g. Ash leaf.

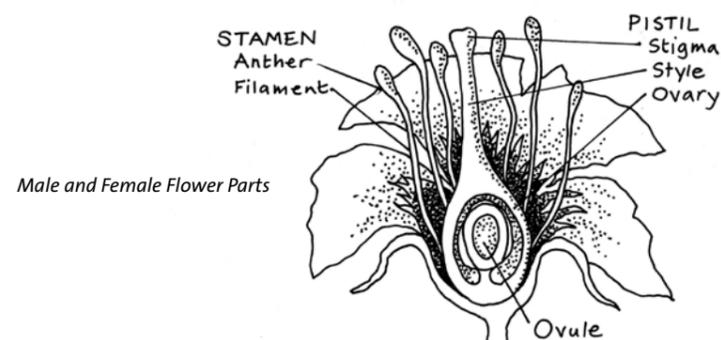
Plant parts - flowers

Flowers are important in making seeds. Flowers produce pollen. Once a flower's ovule has been fertilised (by pollen that is produced by the anther), it becomes the seed and the ovary of the flower becomes the fruit. This is a very important part of the life cycle of plants. Petals are also important parts of the flower because they help attract pollinators such as Bees, Butterflies and Hoverflies with their colours. You can also see tiny green leaf-like parts called sepals at the base of the flower. They help to protect the developing bud.

Plant parts - fruit

The fruit is the ripened ovary of a plant containing the seeds. After fertilisation, the ovary swells and becomes either fleshy, or hard and dry to protect the developing seeds. Many fruits help seeds spread. Many things that we label as vegetables are really fruits, for example, tomatoes, cucumbers and beans.

Every seed is a tiny plant (embryo) with leaves, stems, and root parts waiting for the right conditions to enable it germinate and grow. Seeds are protected by a coat that can be thin or thick and hard. Thin coats don't protect the embryo very well but thick coats can let the embryo survive tough conditions. The seed also contains a short-term food supply called the *endosperm*, which is formed at fertilisation but is not part of the embryo. It is used by the embryo to help its growth. Seeds allow plants to disperse. They are transferred from one area to another by wind, water or animals.



What to do:

Provide the background information to your students. Then visit Killiney Hill and conduct activity sheet 6. You can use the diagram here to identify the different parts of a plant on activity sheet 6.

Answers to activity 6: Identify parts of a plant

- Leaves.
- Fruit.
- Seeds.
- Flower.
- Stem.
- Roots.

5.3 Discover your woodland

The following are teachers' notes for activity sheets 7 - 13 and are applicable to trail stops 3 and 6.

Background information for activity sheets 7- 9 – Getting to know a tree/ Woodland structure/Create a food web

This section is designed to introduce school children to a woodland habitat. It aims to encourage children to use important skills like exploring, observing and recording. It will help them discover the plants and trees in a woodland and the layers in which they are found. They will be shown how to recognise a number of plants and then be able to record these in their nature diaries. They will see the importance of light and plants competing for it. Children will expand the use of their senses to experience the sounds, smells and textures of the woodland and by the end of the activities will have discovered how a woodland works.

What to do:

Give a talk to your students about the woodland structure while walking through the trees. Look closely at each layer as described in activity sheet 8. Ask the students to fill in activity sheets 7-9.

Background information for activity sheets 10 -13 - Bark rubbing/ How tall is your tree/How old is your tree/What lives in your tree?

The following activities include interactive activity sheets that require the students to practically investigate the wonderful world of trees by measuring the height of their chosen tree, calculating how old the tree is and discovering what lives in the tree. It incorporates ecology, maths and develops an understanding of tree ecology. The activities are self-explanatory on the student activity sheets. Some of the skills and concepts can be replicated and repeated for shrubs and grasslands.

Useful Information:

Types of invertebrates which may live in woodland	
Ants	Grasshoppers
Aphids	Ground Beetles
Butterflies	Hoverflies
Centipedes	Leafhoppers
Cockchafers	Ladybirds
Crickets	Longhorn Beetles
Daddy-Long-Legs	Millipedes
Earwigs	Moths
Woodlice	Spiders
Flies	Weevils

Definitions of the different organisms:

Invertebrate: An animal without a backbone (e.g. Snails, Worms and Insects).

Arthropod: A type of invertebrate which has a segmented body, a hard external skeleton and jointed appendages that are used for feeding, feeling and walking (e.g. Insects, Crabs and Spiders).

Arachnid: A type of arthropod with four pairs of legs, no wings and usually two body parts (e.g. Spiders).

Insect: A type of arthropod that has three body parts (head, thorax and abdomen) and three pairs of legs. Many have wings. Many undergo complete changes of shape during their life cycle (e.g. a Caterpillar transforms into a Butterfly).

Myriapod: A type of arthropod with many pairs of legs (e.g. Centipedes and Millipedes).

Mollusc: A soft-bodied creature with a hard external shell (e.g. Snails, Mussels and Clams).

5.4 Discover wildlife and their habitats

The following are teachers' notes for activity sheets 14 and 15 and are applicable to trail stops 1, 2, 3, 4 and 6.

Background information for activity sheet 14 – Mini Zoologist

This programme is designed to teach students to investigate and observe wildlife and gain skills in wildlife recording. Wildlife recording is very important as it helps us to learn which animals and plants are found in an area, how many different types of animals or plants there are, and whether from year to year the numbers change. This can tell us about changes in their environment. Recording can also tell us information about where animals and plants like to live and how they behave.

A *Wildlife Record* needs to contain four vital pieces of information:

1. What was seen? - The name of the animal.
2. Where it was seen? - Give as much detail as possible.
3. When it was seen? - The date of the sighting.
4. Who saw it?

It is also useful to describe any activities that the animal is doing such as nesting, resting in the sun, preening its feathers, flying or feeding.

What to do:

Bring the students on a walk through the park and record what wildlife they see. Once they have recorded their wildlife in the field, they can put the information together back in class. See how many records you have made on different visits to your park, and you will start to get an idea of what type of animals and numbers there are. Field guides can be used to identify the animals (see section 8).

Useful terminology:

Biology is the study of living things. *Ecology* is the study of the relationships of living things with their environment. An *ecosystem* is a natural habitat unit consisting of all plants, animals and micro-organisms in an area functioning together with all the physical factors in the area. A *habitat* is the place where animals normally live. An animal's habitat provides a particular set of conditions needed for it to live. A habitat may be large, for example, a woodland, or small for example, a branch on a tree.

Vertebrate: An animal with a backbone (e.g. Mammals, Birds, Reptiles, Amphibians and Fish).

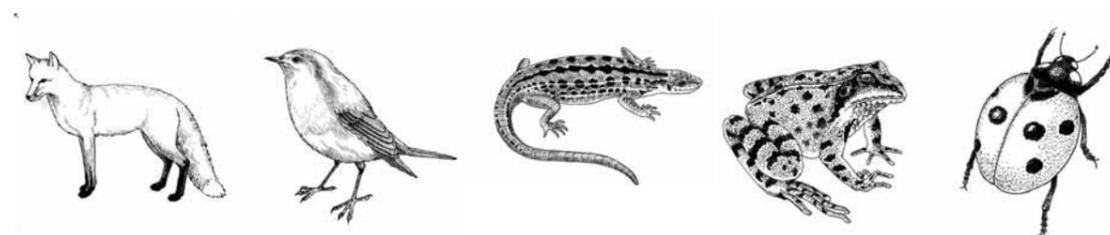
Mammal: A warm-blooded vertebrate that can maintain their own body temperature. Mammals have hair and have sweat glands and give birth to live young and suckle (e.g. Humans and Foxes).

Bird: A warm-blooded vertebrate that has wings, feathers and a beak. They usually lay eggs and can sometimes fly. Most birds can fly but some cannot e.g. Ostrich.

Reptile: A cold-blooded vertebrate with scales on their skin. They spend all their life on land and most lay eggs (e.g. Lizards and Snakes).

Amphibian: A cold-blooded vertebrate that has moist skin. They usually breed in water but also spend time on land (e.g. Newts and Frogs).

Invertebrates: An animal with no backbone. Insects, slugs, crustaceans and spiders don't have a backbone. They usually have their skeletons on the outside to protect their soft bodies. (e.g. Flies, Ladybirds and Worms).



Fox

Robin

Common Lizard

Frog

Ladybird

Species: A species refers to different types of animals. For example, there are two species of Squirrel in Ireland, one species is the Red Squirrel and the other species is the Grey Squirrel.

Carnivore: An animal that eats meat (another animal). They have sharp teeth (e.g. Wolf).

Herbivore: An animal that only eats plants (e.g. Deer and Rabbits).

Omnivore: An animal that eats both plants and animals as part of a mixed diet (e.g. Fox)

Predator: An animal that hunts and kills other animals for food.

Prey: An animal that is hunted by a predator.

Scavenger: An animal, such as a bird or insect, that feeds on dead or decaying matter.

Background information for activity sheet 15 - Animal tracks and signs

The purpose of this activity is to have the students observing and looking for evidence of animals in their park. The first part of the activity sheet outlines what tracks and signs animals leave behind them. As many mammals are nocturnal, you might not see any during the day but this activity will show the students that animals are there even if they don't see them. You might be lucky and see a fox or its droppings.



Dog

Fox

Badger

Sika Deer

Rat

You will need:

- A Guide to Mammal Tracks and Signs (see section 8 for more details).
- A magnifying glass (if possible).
- A white tray (helps show any materials clearly because of the white background).

What to do:

1. Pick a good place to look, possibly beside the scrub near the Obelisk. If there is nothing there, move on to another area.
2. Divide the students into groups and give them one copy per group of the activity sheets. They must work as a team, looking in the park for evidence of animals such as droppings, a burrow or even the trail a snail makes when moving.
3. When the students have finished recording their findings, compare it with their classmate as they may have seen different things. They can share the experience.
4. Once they have completed this activity congratulate them for becoming Wildlife Trackers.

Note: If you don't know what it is, take a photograph, or get the students to draw pictures in their Nature Diaries.

5.6 Lichen studies

The following are teachers' notes for activity sheet 16 and applicable to trail stop 5 which is a stone wall habitat.

Background information for activity sheet 16 – Lichen studies

Air pollution: When the air we breathe is polluted, it has a bad effect on all forms of life from humans to animals to plant life. In complicated animals like humans, the bad effects may not be very obvious. In simple plants like lichens, it is easier to tell the connection between lichens and air quality. Different species of lichen show different levels of sensitivity to air pollution, some are more tolerant than others. They are very useful for this reason! In this activity, we use lichens as indicators of air quality.

What is a lichen?

A lichen is more than a single thing. It is a partnership between two different types of living creatures: a fungus and an alga. Neither of these organisms is a plant, so the lichen isn't a plant either. Lichens can absorb nasty elements like sulphur dioxide from the air. Sulphur dioxide is a form of air pollution. There are many different species of lichens (over 1,500) but they all fall into three groups:

(a) Fruticose (Shrubby) lichens

These have many surfaces exposed to the air and can be badly affected by sulphur dioxide. They are not found in cities and towns, or places with high levels of pollution.

(b) Foliose (Leafy) lichens

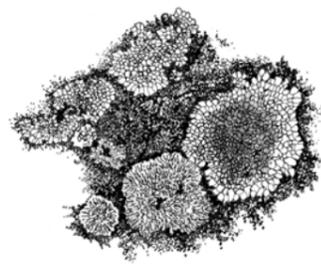
These are more flattened, have less exposed surfaces and can live through some pollution. They occur in the outskirts of towns.

(c) Crustose (Crusty) lichens

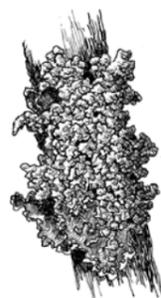
These are closely pressed to the surface on which they grow. They are able to withstand higher levels of sulphur dioxide pollution and can often be seen right in the centre of our big towns.



Fruticose Lichen



Crustose Lichen



Foliose Lichen

How do you determine levels of air pollution in Killiney Hill?

By looking at trees, walls or rocks and analysing the presence or absence of the lichens, then allowing the students to make an assessment from the I.D. Guide provided on activity sheet 16.

You will need

- A Nature Diary and pencil.
- A Lichen I.D. Guide (provided on the first page of activity sheet 16). - A magnifying glass.

ACTIVITY SHEET 1: MAKING A NATURE DIARY

A good way to study nature is simply to look and listen! If you write things down that you see and hear, you will remember them afterwards. Make a Nature Diary, and you will soon see how nature changes during the different seasons.

To make your nature diary, you will need:

- A notebook.
- A pencil.
- Colouring pencils/ crayons.

What to do:

1. Every time you visit Killiney Hill, you are visiting a variety of habitats. A habitat is where animals and plants live, e.g. woods, grassland and stone walls.

Include the following information:

- Date (e.g. Wednesday 21st June 2010).
- Weather (e.g. cloudy).
- Season (e.g. Autumn).
- Habitat (e.g. woodland).

2. Make a list on a different page of all the different types of animals and plants that you see. Each type of animal or plant is called a species. Where do you see the animals? What are they doing?

3. You might see something unusual, such as a rare bird like a Peregrine Falcon. Write about it, draw it or take a photo. Stick your photos into your diary.

4. Sometimes you might see an animal or a bird that you do not recognise. Make a drawing of it in your diary or take a photograph. Then you can identify it with a field guide when you get back to class. Make a note of different colours, patterns and write about where you saw it and what it was doing.

Happy Nature Watching!



ACTIVITY SHEET 2 - JOURNEY TO KILLINEY HILL

Before you begin your journey to Killiney Hill, try to find a map of the area.

Instructions:

1. Locate your school on the map.

2. What is the distance from your school to Killiney Hill in kilometres?

3. Are you travelling by bus, walking, or getting a lift in a car?

4. How much time did your journey to Killiney Hill take and record the direction travelled, e.g. North, South, East or West?

5. Do you pass by any public buildings such as a library, a court house, or county council offices? If so, what are they called?

6. Make a list of habitats that you see on your journey in the spaces provided below, e.g. do you pass by a river, a beach, a forest or a pond?
 1.

 2.

 3.

 4.

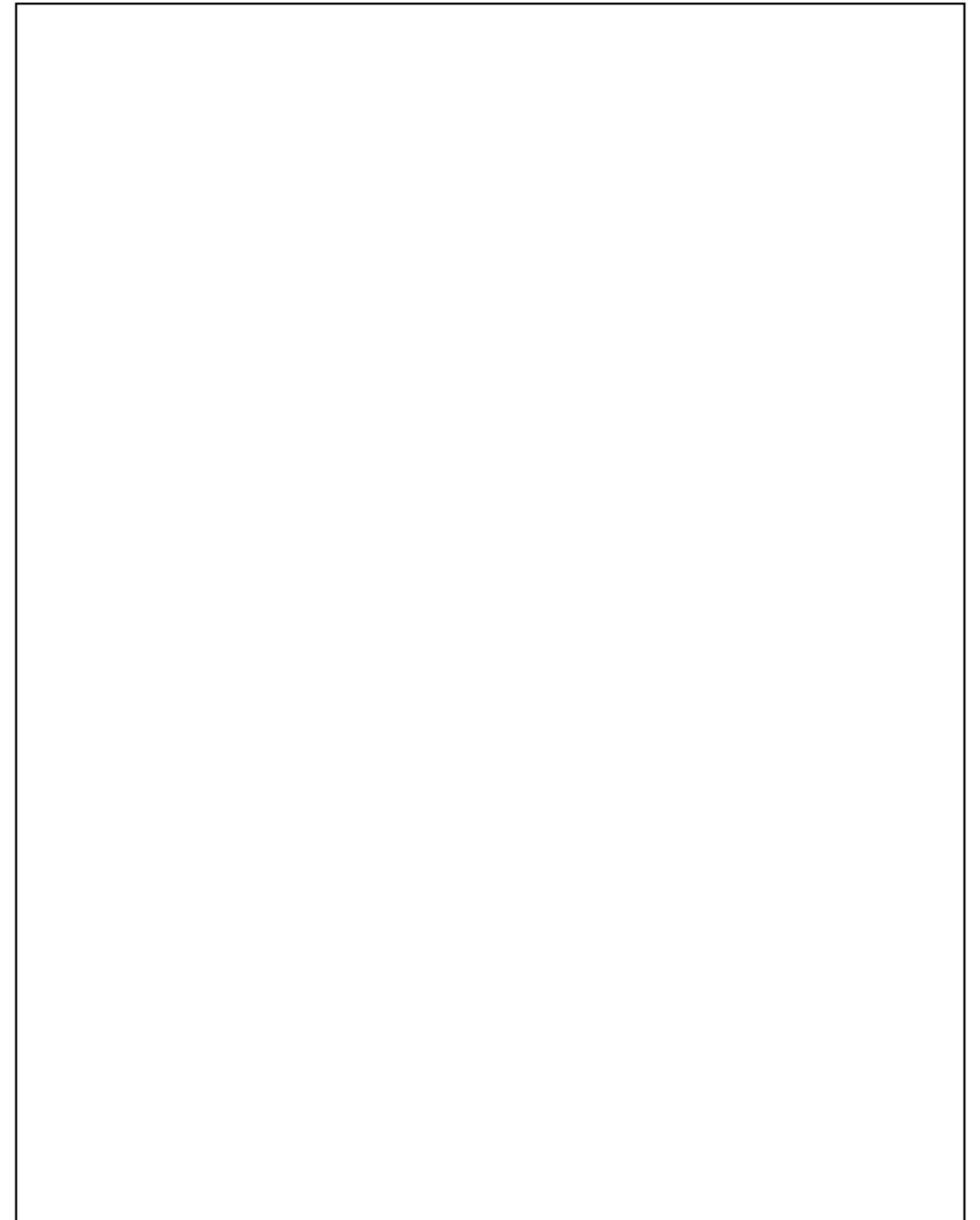


ACTIVITY SHEET 3 - MAKING A MAP

It is important to first get a good idea of your study area by drawing a map of it.

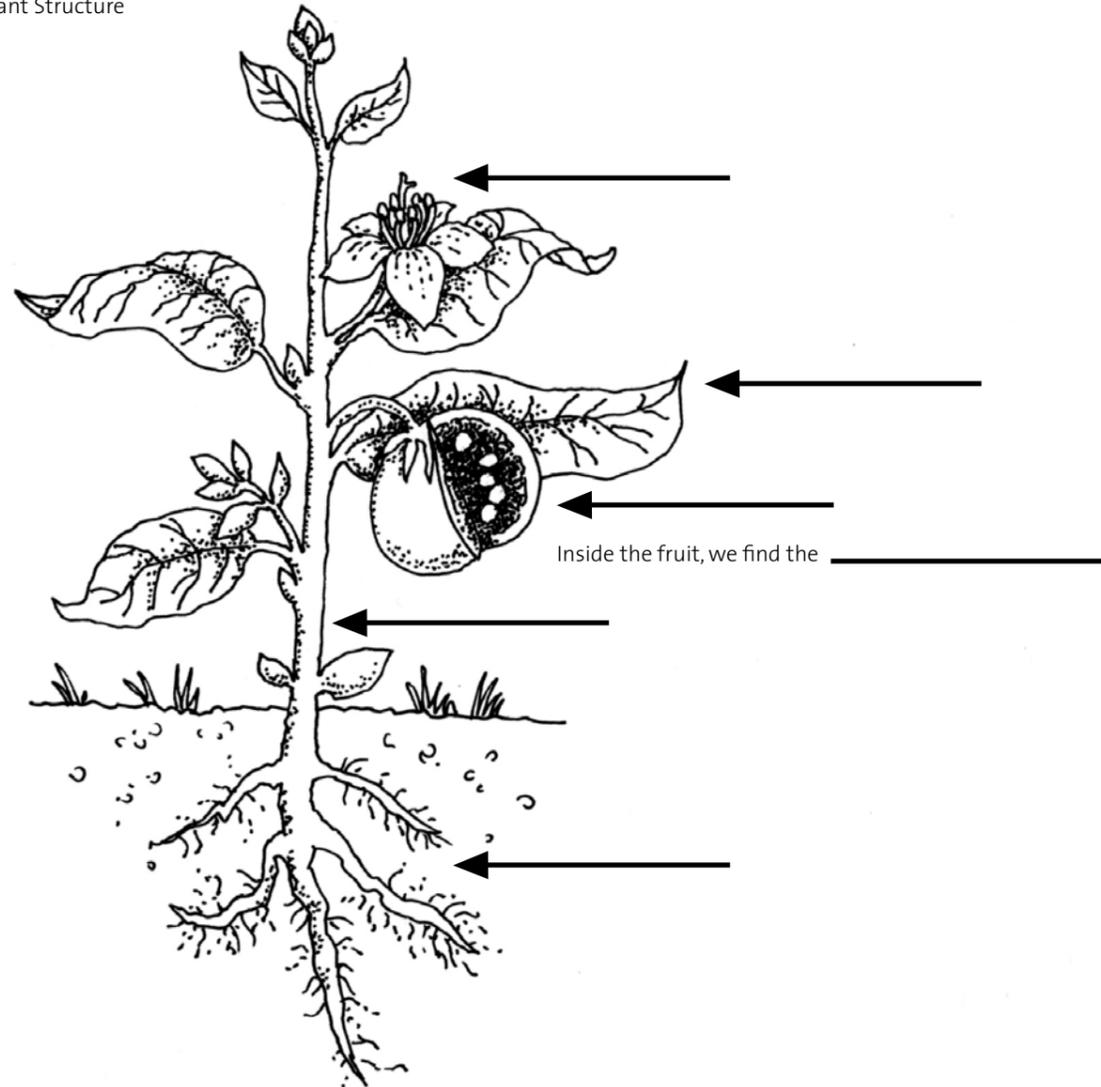
Draw a map of your study area in the box provided, and include the different nature features such as the grass, trees and manmade features such as a car park, path and monument.

Draw and label any important features. For example, the location of a wildflower meadow.

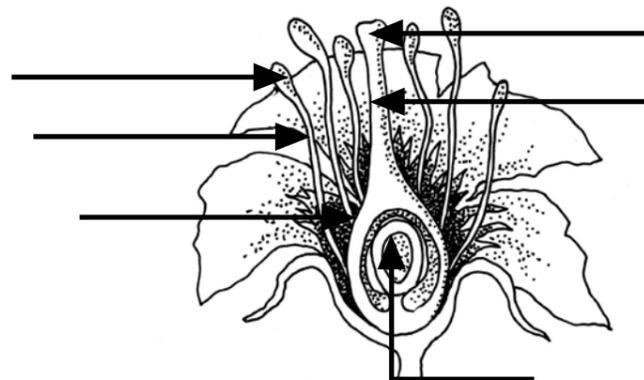


ACTIVITY SHEET 6 - IDENTIFY PARTS OF A PLANT

Plant Structure



Male and Female parts of a flower



ACTIVITY SHEET 7 - GETTING TO KNOW A TREE

You will need:

- A pencil.
- A Tree Identification Guide

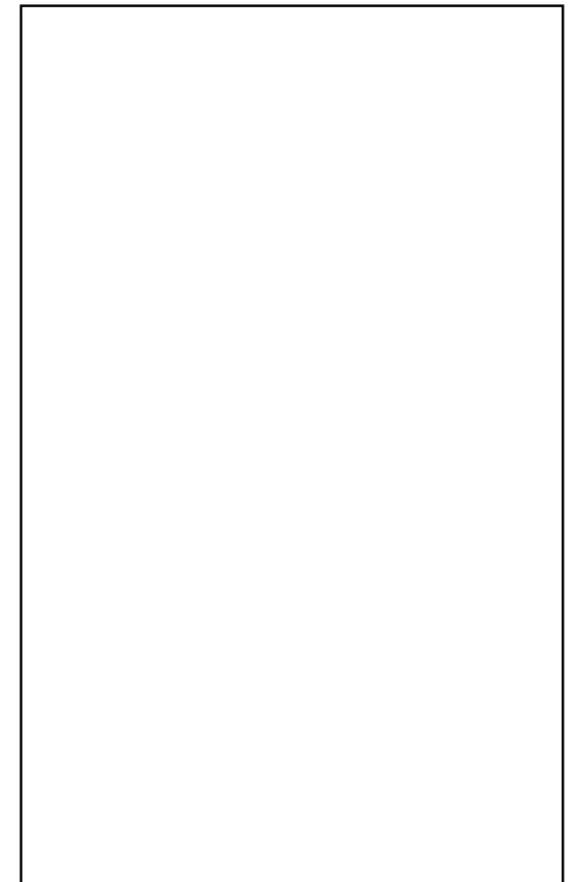
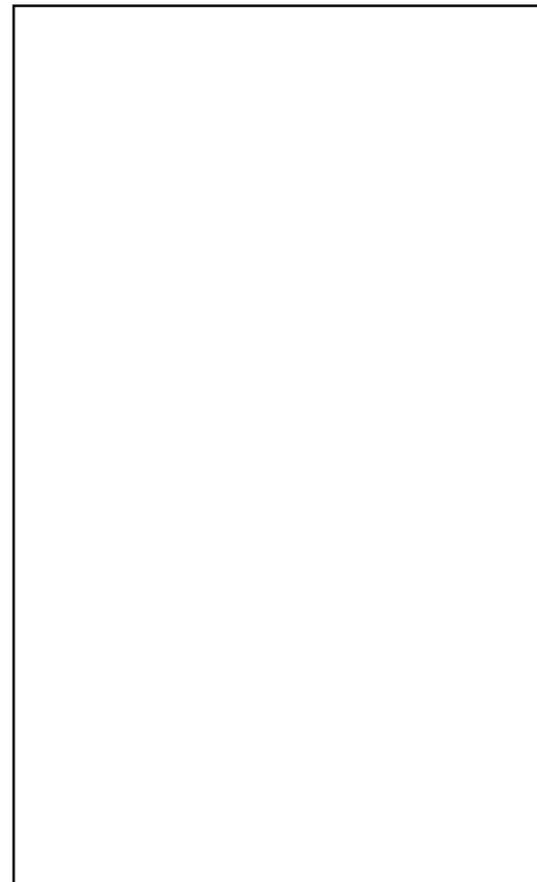
What to do:

1. Choose a tree to study on Killiney Hill.
2. Collect and examine a leaf from your tree and if available, some seeds and fruit (late summer/ autumn), from the same tree on the ground layer.
3. What is the name of your tree? _____

(Use a Tree Identification Guide to identify your tree from the leaves, bark or seeds)

Trees are divided into two main groups. A flattened and wide broadleaf tree loses its leaves every Autumn and is called deciduous, but a conifer is evergreen and keeps its needle like leaves all year round.

4. Is your tree a broadleaf or a conifer? _____
5. Draw and label two things from your tree that you have found. (e.g. leaf, fruit, cone, flower).



ACTIVITY SHEET 8 - WOODLAND STRUCTURE

You will need:

- A measuring tape.
- A pencil.

A woodland has four layers that make up its structure. Not all woodlands have every layer. It depends on how much light can reach through to the woodland floor.

- 1. Canopy Layer:** You can find older, taller trees such as Oak, Yew, Ash, Birch, Beech, Sycamore and Scots Pine.
- 2. Shrub Layer:** You can find younger trees or smaller trees and shrubs such as Hazel, Hawthorn, Honeysuckle, Holly and Elder.
- 3. Herb Layer:** You will find ferns and woodland plants in the herb layer. Their presence depends on the amount of light that is able to get through so that they can grow. If the canopy or shrub layer is very thick and dark, there will not be many plants in the herb layer (e.g. Beech woodland).
- 4. Ground Layer:** You can find dead leaves, natural debris, rotting logs and mosses.

Student Instructions:

Take a walk through the trees. Mark an area 10 x 10 metres with string or sticks using your measuring tape. Study the woodland structure within this area. In your study area, identify what trees, plants and other vegetation are in your woodland.

List two trees in the canopy layer:

List two shrubs in the shrub layer:

List two plants in the herb layer:

List two things in the ground layer:

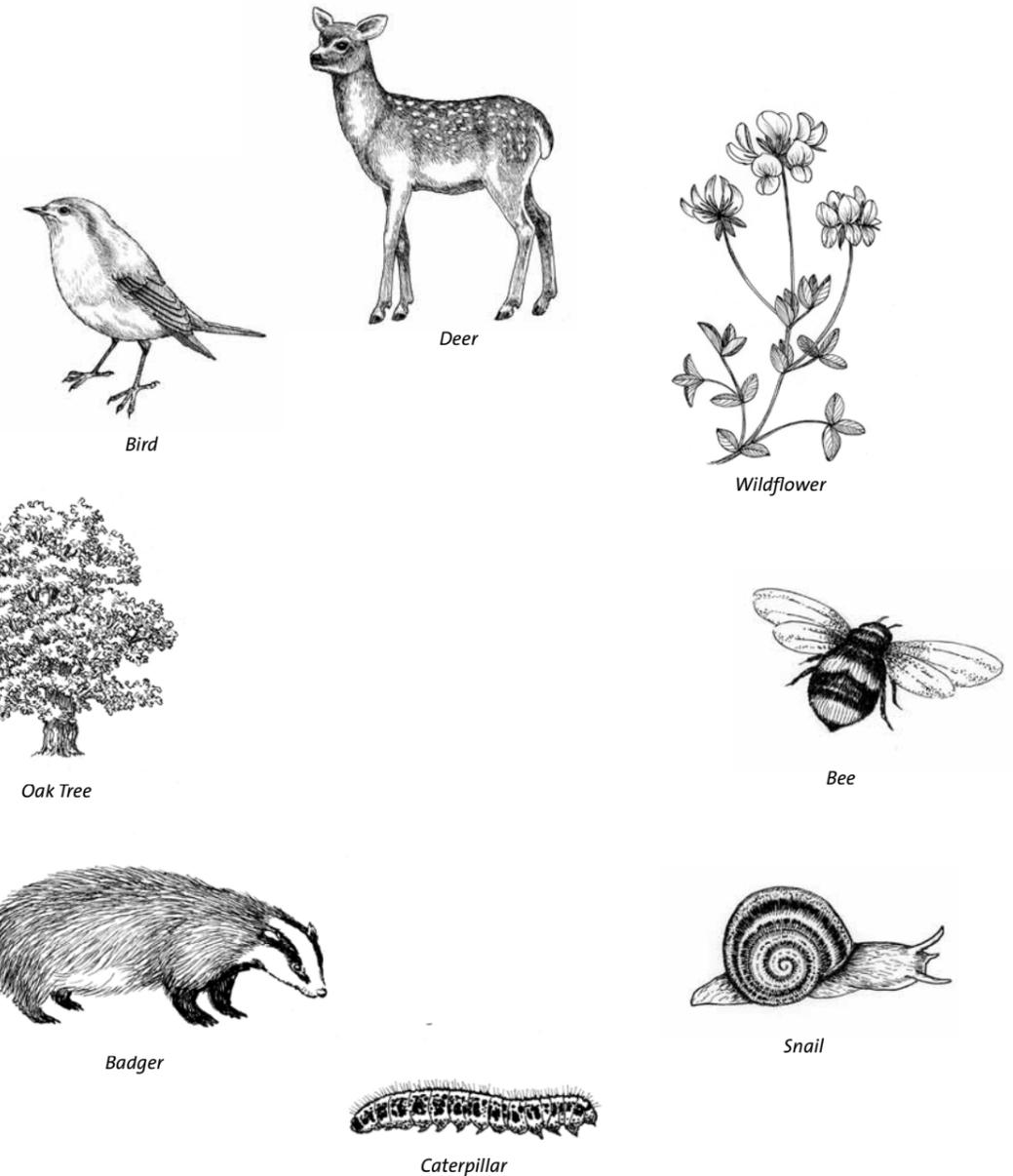
Observe your study area. It is very important how much light the trees and plants get from the sun. Some need more light than others and that is why some trees grow really tall and others don't. Plants and trees use the light from the sun to make their own food as part of a process called photosynthesis. The plants are eaten by animals. Therefore, the sun is an indirect source of food for all living organisms on the planet.

Is your study area dark or bright?



ACTIVITY SHEET 9 - CREATE A FOOD WEB

Draw lines to connect the animals and plants together. Start with the plant. What eats plants? Then connect the smaller animals to other animals that eat them. For example: Snails eat plants, the Badger eats the snail. What else do Badgers eat?



ACTIVITY SHEET 10 - BARK RUBBING

You will need:

- Greaseproof paper or ordinary white paper.
- Crayons.
- Sellotape.

Student Instructions:

1. Sellotape the greaseproof paper securely onto the trunk.
2. Use the crayon to rub firmly over the whole sheet. You will see how the bark pattern begins to show on the paper. Do not try to fill the blank spaces as they make up part of the pattern.
3. Write your name and the species (type) of the tree, e.g. Oak, Elm, Chestnut on the top of the bark rubbing
4. Describe the bark of your tree

5. Look at your friends' bark rubbings. Are they different? (Tick the correct answer)

Yes No

6. Describe how they are different. (Hint: Look at the shapes. Are they straight lines, diamond or circular?)



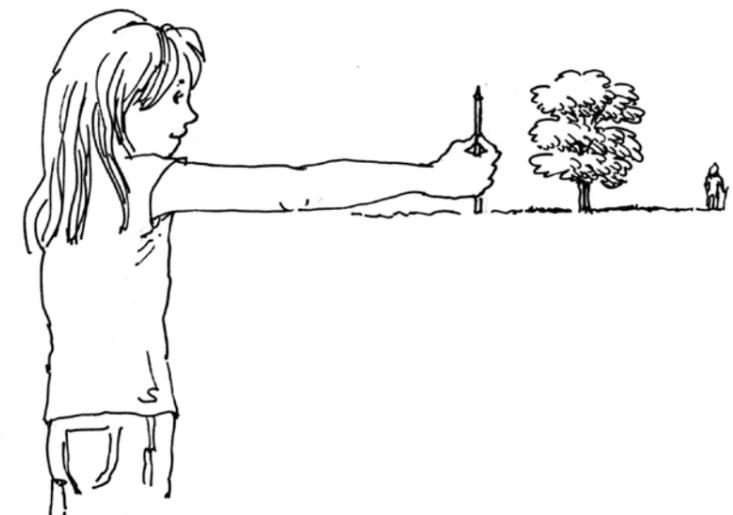
ACTIVITY SHEET 11 - HOW TALL IS YOUR TREE?

You will need:

- A pencil.
- A measuring tape.
- A stick.

Student Instructions:

1. Get into a team of two people.
2. Stand in a place where you have a good view of your tree.
3. Hold your pencil upwards and at arms length.
4. Walk backwards until the pencil seems to be the same height as the tree. Keep one eye closed while you do this. Ask your friend to watch you so that you don't walk into anything or fall over!
5. Do not move from this spot. Turn your pencil sideways, positioning one end of it so that it looks like it is against one side of the tree.
6. Ask your friend to walk to that side of the tree carrying the stick, which you have brought.
7. Shout 'STOP!' when your friend reaches the end of the pencil. Ask them to mark the spot with the stick.
8. Measure the distance from the tree to the stick. This is the approximate height of the tree. Repeat the exercise to make sure that you did it correctly.
9. The height of our tree is _____ metres.



ACTIVITY SHEET 12 - HOW OLD IS YOUR TREE?

You will need:

- A pencil.
- A measuring tape.

Trees found in Open Spaces: If the tree is in an open space, then its girth (width) will have increased by about 2.5 cms every year. For example, if the girth is 30 cm, then divide 30 by 2.5 to get the approximate age.

Trees found in Wooded Areas: If your tree is growing in a wooded area, then its girth (width) will have increased by approximately 1.25 cms every year. If your tree girth is 30 cm, then divide 30 by 1.25 to get the approximate age. (Your teacher can help you with the maths).

Student Instructions:

1. Looking at your tree, how many years old do you think it is? _____
2. Measure the girth (which is the measurement around the whole trunk) by placing a tape around the trunk and measuring the girth in centimetres (cms).
3. Record your findings here:

Our tree grows in an open space _____ (yes/no).

Our tree grows in a wooded area _____ (yes/no).

The girth of our tree is _____ cms.

Our tree is _____ years old.
4. Is your answer the same as you wrote for question 1? _____
5. Now look for an older or younger tree of the same species and measure its age.

The girth of the second tree is _____ cms.

The second tree is _____ years old.



ACTIVITY SHEET 13 - WHAT LIVES IN YOUR TREE?

Ants have six legs and 3 body parts (head, thorax, abdomen). Spiders have 8 legs. Woodlice usually have 14 legs. Worms have no legs! There are many different types of bugs living in just one tree or one patch of soil so get investigating! Small creatures like some types of trees more than others. Find out what likes to live in your tree.

You will need:

- A tweezers.
- A magnifying glass (if available).
- A pencil.
- A large white sheet of paper or a sheet.
- One long stick.
- An Insect Field Guide.

Student Instructions:

1. Place your large white piece of paper or sheet directly under your tree.
2. Use your long stick to shake the branches of the tree overhead. Be gentle with the tree and the creatures living in it.
3. Count the number of creatures that fall onto the white sheet.

How many different types are there? _____
4. Use the Tweezers to gently pick up one insect to study with your magnifying glass. Using the Insect Field Guide, try to identify your creature.

Type of creature: _____

How many legs does it have? _____

Does it have wings to fly? _____

What colour is it? _____

Note: You can also search the bark for bugs. Look into the cracks in the bark or on the ground under dead leaves and rocks.



Spider



Shield Bug



Caterpillar



Aphid



Millipede



Woodlouse

ACTIVITY SHEET 14 - MINI ZOOLOGIST

Choose an animal to study (e.g. a bird in the park), and record the number of times you see it. When you record a sighting of this animal, you should write down information such as the time, date, weather and habitat on this sheet. You can use this sheet every time you visit your park. This way, you will build up a great deal of information about your chosen animal. Try going back at different times of the year to see if your chosen species can be seen.

Record details

Name of Site: _____

Date: _____

Animal to be studied: (e.g. Magpie) _____

Is your animal a vertebrate or an invertebrate? _____

How many animals of the same species can you see? _____

What is the weather like? _____

Time of day: _____

What is the animal doing? _____

Describe the habitat:

Any other information:



Robin Foraging

ACTIVITY SHEET 15 - ANIMAL TRACKS AND SIGNS

While visiting your park, there are many clues to look out for that show that animals have been near, even if you have not seen them. They leave evidence behind them.

Footprints: When the ground is soft or muddy, animals often leave their foot impression. You can tell what animal it is by the shape of their footprint.



Droppings: An animal's droppings can tell you which animal it is, what the animal eats and where you find them. A Fox's droppings can be found in many settings and you can see bone and feather remains in it. Look at them with a white background, as they will show up better.

Signs of feeding: We can often see where an animal has been eating by feathers or bones that are left behind



Nests and burrows: These show us where animals live. Most burrows have a muddy path leading to them with footprints at the entrance. Nests can be seen in hedgerows or trees. Never try to touch a nest, as this can harm baby birds or scare the mother away.

Other signs: Many animals leave scratches and other signs behind, e.g. fur caught on a fence, feathers that have fallen out of a bird or scratches on the bark of a tree.

Record your findings

Where are you in Killiney Hill? _____ Date: _____

What have you found? Fill in your findings in the boxes below. Compare with your classmates, what did they find?

Droppings				
Footprints				
Signs of Feeding				
Nests or Burrow				
Trails				
Other Signs				

Finding out about animals is about observing and looking for evidence. We can track their movements and find out more about their behaviour.

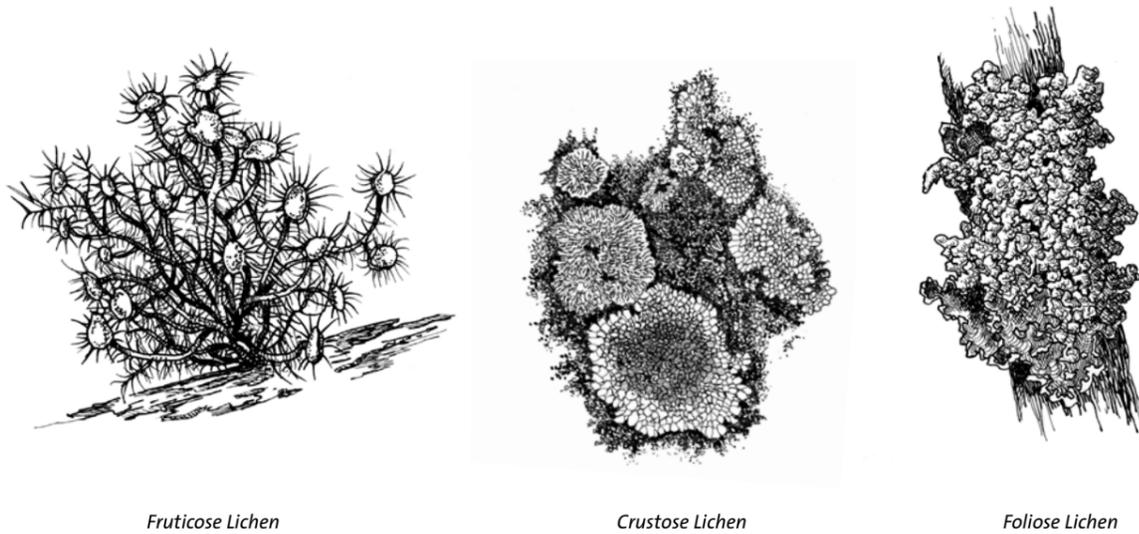
ACTIVITY SHEET 16 - LICHEN STUDIES

Take a look in the park, and see if you can find some lichens growing on trees, walls, stones or in the spaces between bricks. With your Lichen I.D. Guide you will be able to find out if the air in your park is clean, moderately pollution, or very polluted. Lichens are sensitive to pollution but some will tolerate it better than others.

Lichen guidelines:

- Absence of lichens tells you that there are high levels of air pollution
- Presence of Crustose (Crusty) Lichens tells you that there are moderate levels of air pollution. (These lichens lie flat on the surface like a crust that cannot be removed)
- Presence of Foliose (Leafy) Lichens tells you that the air is slightly polluted. (These lichens lie flat on the surface, but have leaf like parts that can be easily pulled away)
- Presence of Fruticose (Shrubby) Lichens tells you that the air quality is clean. (These are bushy lichens which often hang from trees or protrude from rocks)

Use this **Lichen identification Guide** to help you identify them when in the park:
 Count the number and different type of lichens you find on a tree or wall and write their names on the chart provided.
 Use a magnifying glass if possible. You could also take a photo or make a drawing of the different types of lichens in your nature diary.



Where are you looking at lichens? For example, a tree or a wall.

Fill in your findings in the table below. When you see a Crustose, for example, put a tick in the box.

	Crustose	Foliose	Fruticose
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

What type of lichen did you see the most?

Using the Lichen Guidelines, what does this tell you about that area in Killiney Hill?

Make a list of any activities in the area that could cause air pollution.

Discussion Time!

What can we do to help improve air quality in our area? Have a discussion with your classmates about what you could do to reduce air pollution, e.g. energy saving, don't burn rubbish in your back garden, walk or cycle to the park.

A. SCAVENGER HUNT

Take this list with you to Killiney Hill. Identify all the things that are listed below.

- A leaf.
- Something wet.
- A berry.
- A wind-dispersed seed.
- An animal from the bark of a tree.
- A feather.
- Something with a strong smell.
- Three pieces of litter (do not touch the litter).
- A fungus.
- A smooth stone.
- A lichen from the trunk of a tree.
- A leaf that's not green.
- Something red.
- A wildflower.
- Something unusual.



Hawthorn Leaf



Feather



Fungus

B. PREDATOR PREY GAME

You will need: 2 different coloured balls.

Instructions:

The group needs to stand in a circle. The leader hands out two different balls, which represent a Fox and a Squirrel. Everyone is a tree. The fox can only be passed to the person standing next to you but the Squirrel is a flying Squirrel and can be thrown to anybody in a circle. If you have both Fox and Squirrel in your hands at the same time, you're out!

C. BATS AND MOTHS

You will need: a blind fold and a rolled up newspaper.

Instructions:

Blind fold one person. They will be the "Bat". Give them the rolled up newspaper which will act as the detecting device. Please advise the Bat to use this rolled up newspaper carefully and not hit the moths too hard. They should swing gently to mimic the Bat's echolocation or sound waves. The others in the group form a circle around them. Two others take the role of the Moths inside the circle, which tries not to get caught by the Bat. Every time the Bat shouts out "Bat", the Moths must shout back "Moth" so they see how the Bats use echolocation to catch their prey by tipping them with the newspaper.



Echolocation: Bats use echolocation to navigate and forage. Bats echolocate by sending out high frequency calls that bounce off objects and return as an echo. Bats locate small prey by judging the length of time it takes the echo to return.

D. CALLS OF THE WILD

You will need: blindfolds for everyone.

Instructions:

Divide group into pairs. Each pair must decide on an animal sound for themselves. Blindfold everyone and separate the pairs. Each pair must try and find the other by listening out for the others animal sound.

E. MEET A TREE

You will need: blindfolds for half the group.

Instructions:

Mention how many insect species depend on an Oak tree (350 – the largest amount of any tree) compared to a Sitka Spruce (10 or so). Talk about native trees versus non-natives trees and the importance of native trees for wildlife. Divide the group into pairs and blindfold one of each pair. The other must lead the blind child in a "round-about" way to a tree and "introduce them" to that tree, making them feel the bark, the leaves, the smell, the girth of the trunk, etc. Then they must lead them back (again in a "round about" way to where they started). Taking the blindfold off, the child must find the tree they were introduced to.

There are many different books, guides and websites available to help you identify our native species in the field. Here are a few suggestions but feel free to try others.

Your local library is a good place to start, drop in and check out what they have in their natural history section.

IWT: The Irish Wildlife Trust has information packs available on our native animals. Just contact them and ask for "Fact files on Nature".

ENFO: The Centre for Information on the Environment is an online resource with loads of information on Ireland's biodiversity. Look at their poster and leaflets' section for great information on specific habitat types, and the flora and fauna you can expect to find there.

Websites

<http://www.iwt.ie> - The Irish Wildlife Trust

<http://www.enfo.ie> - ENFO Website

<http://www.iwdg.ie> - The Irish Whale and Dolphin Group

<http://www.batconservationireland.org> - Bat Conservation Ireland

<http://www.birdwatchireland.ie> - Birdwatch Ireland

<http://www.noticenature.ie>

<http://www.biodiversityireland.ie>

Books

Habitats - Fossitt, J. (2000). *"A Guide to Habitats in Ireland"*. The Heritage Council.

General - Mooney, D. & Sterry, P. (2004). *"Complete Irish Wildlife: Photoguide"*. HarperCollins Publisher Ltd.

Tracks and signs - Preben B. & Preben D. (2006). *"Animal Tracks and Signs"*. Oxford University Press.

Birds - Svensson, L., Grant, P.J., Mullarney, J. & Zetterstrom, D. (1999). *"The Most Complete Guide to the Birds of Britain and Europe"*. HarperCollins Publisher Ltd.

- Caboy, D. (2004). *"Irish Birds"*. HarperCollins Publisher Ltd.

Plants - Johnson, O. (2006). *"Tree Guide"*. HarperCollins Publisher Ltd.

- Blamey, M., Fitter, R. & Fitter, A. (2003). *"The Wildflowers of Britain and Ireland"*. A & C Black Publishers Ltd.

- Rose, F. & O'Reilly, C. (2006). *"The Wild Flower Key: How to identify wild plants, trees and shrubs in Britain and Ireland"*. Penguin Group.

Invertebrates - Chinery, M. (2004). *"Butterflies"*. HarperCollins Publisher Ltd.

- Chinery, M. (1993). *"Insects of Britain and Northern Europe"* HarperCollins Publisher Ltd.

Field Charts

The Field Studies Council (FSC) is a British organisation that publishes a wide range of well illustrated identification guides. Most of these will be useful for Irish species too, for example;

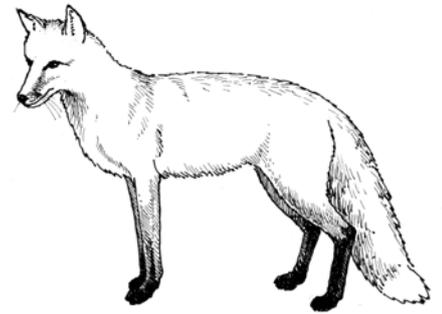
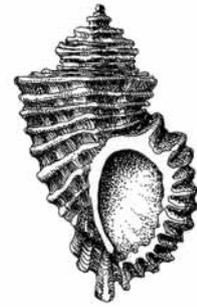
1. A guide to mammal tracks and signs.
2. Butterflies.
3. British land mammals.
4. Day flying moths.
5. Bugs on bushes.
6. The woodland name trail.
7. Tree name trail.
8. Urban lichens on stone and soil.
9. Urban lichens on trees and wood.
10. A guide to hedgerows.
11. A key to the major groups of freshwater invertebrates.
12. The rocky shore name trail.
13. Common seaweeds.

They can be bought directly from their website at the following address:

<http://field-studies-council.org/publications/foldout.aspx>

1. Please advise students to wear appropriate footwear, i.e. runners or waterproof footwear. If it has been raining, advise Wellingtons.
2. Ask students to wear clothing that is appropriate i.e. school tracksuit or otherwise just in case they dirty their clothes.
3. Please ask the students to bring their coats or rain gear to school, especially as the weather can be unpredictable.
4. Please instruct the students to not run away from the group and to stay in eye sight of their teacher or an instructor and listen to the instructions at all times.
5. Students must stay behind their teacher or instructor at all times on the site visit as they know the way.
6. If the students see something outside of the immediate area, they must seek permission and let it be known where they are going.
7. Bring a first aid kit with you for any cuts or stings.
8. Let them enjoy themselves and learn lots about nature.

Curriculum Title Social, Environmental, Scientific, Education						Arts Education (Visual Arts)	
	Skills and concept Developments	Strands				Skills and concept Developments	Strand
Activity sheet	Geographical investigation skills including questioning, observing, recording and communicating	Natural environments including the local environment	Environmental awareness and care	Living things including plants and animals	Human environment including natural environmental features and people, settlements including homes and other buildings	An awareness of form, texture, pattern and rhythm	Drawing including making a drawing, looking and responding
1	√	√	√	√		√	√
2	√	√			√		
3	√	√	√	√	√	√	√
4	√	√	√	√		√	
5	√	√	√	√			
6	√	√	√	√		√	
7	√	√	√	√		√	√
8	√	√	√	√			
9	√	√	√	√			
10	√	√	√	√		√	√
11	√	√	√	√			
12	√	√	√	√			
13	√	√	√	√			
14	√	√	√	√			
15	√	√	√	√		√	
16	√	√	√	√		√	



Dún Laoghaire-Rathdown
County Council
County Hall,
Marine Road,
Dún Laoghaire,
County Dublin

Tel: 01 2054700
www.dlrcoco.ie

