dlr Biodiversity

An Roinn Tithíochta, Rialtais Áitiúil agus Oidhreachta
Department of Housing, Local Government and Heritage

Dún Laoghaire-Rathdown County Council

Hedgerow Toolkit for Schools

Contents

Introduction

Hedgerows are often overlooked as part of our biodiversity in Ireland. However, they are very important as a refuge for wildlife displaced by our declining woodlands over the centuries.

While this island was once covered in deciduous woodland, it has since been reduced to only 2% of landcover. Therefore, the hedgerows that create the patchwork of our traditional Irish landscape now act as an extremely important habitat for wildlife - be that somewhere for them to live, find food or move safely through the landscape. Astonishingly, Irish hedgerows stretch for an incredible 689,000km up and down the roads and fields of Ireland. This is the equivalent of wrapping around the earth 17 times! Due to their importance, hedgerows are protected by law and there are strict times when they can be cut. We hope you enjoy exploring the wonderful world of hedgerows with your class!

There are activities included for those schools with local hedgerows they can easily visit and other activities for those schools who don't have a local hedgerow.

Lesson Plan 1

What are hedgerows? An introduction to hedgerows and their benefits

Introduction

Write the word 'home' on the board. Get the children to think, pair and share about what makes a good home. Write the answers on the board and discuss. Decide what the key requirements are, e.g. shelter, food.

Discuss how habitats provide many of these same needs to animals. An animal needs food, shelter, space and water and a habitat provides these.

Ask the children to name some habitats. Answers may include woodland, desert, rainforest, mountains. Ask them to focus on Irish habitats, e.g. rivers, lakes, hedgerows, trees. Can they name any local ones?

Did anyone mention hedgerows as a habitat? Today we will focus on a hedgerow habitat. Show the students the different photographs of hedgerows – e.g. a neat laurel hedge in a housing estate through to the 'best' native hedgerows. Discuss the different hedgerows.

Can they name or describe any local hedgerows e.g. in their gardens at home, on the way to school, at school?

Laurel hedging along a housing estate has very little biodiversity because it is a plant that is not native to Ireland and the hedge only contains one plant species. Hedgerows of biodiversity value have a diversity of native shrubs, ground plants and some trees, for example hawthorn, blackthorn, ash, oak, bramble, ground ivy and cow parsley.

Laurel is a common plant used for non-native hedging and is not as good for biodiversity. © Juanita Browne

A good hedgerow often has a bank or ditch and a grassy margin with lots of different wildflowers and grasses. Sometimes it might have a badger family or an otter living below the hedgerow!

Some hedgerows are lined by ditches or drains which can be filled with water. This hedgerow's ditch has been colonised by Yellow Flag Iris. © Juanita Browne

Native hedgerows contain a mixture of native plants, but usually contain lots of Whitethorn and Blackthorn. Blackthorn has white flowers in March, while Whitethorn flowers later in May. © Juanita Browne

Ask why do you think hedgerows exist? Why do we need them? Explain that originally hedgerows were used to divide land up. Indeed in medieval times hedgerows were planted to enclose areas of land owned by a landlord. These hedgerows then showed where the boundary or edge of a townland is found. Townland boundary hedgerows tend to have larger banks and ditches than other hedgerows, and are the oldest hedgerows in the landscape. For these reasons they also contain more biodiversity than other hedgerows. Most Irish hedgerows were planted in the 1700s and 1800s when new laws were introduced through which landowners had to put in place permanent boundaries between their properties. This was to stop livestock from wandering onto other people's lands where crops were growing. Other hedgerows were planted along railway lines and along roads. Did you know that our county has around 2,370 hedgerows!

Ask the students if they can think of other things that could be used to show a boundary? For example walls, fences, GPS etc. Write their answers on the board. Which boundary do they think is the best? The students need to justify their answers. Ask what they think are the benefits of hedgerows and why do they think hedgerows could be planted instead of these other options?

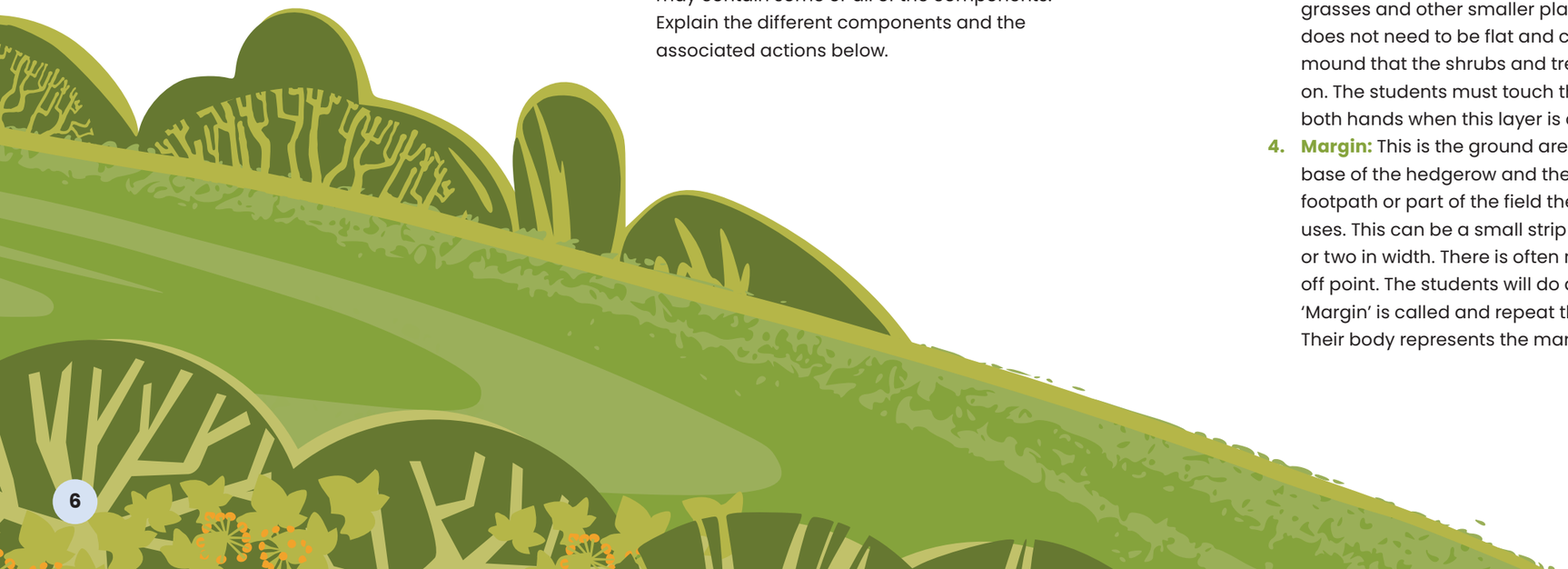
The benefits of hedgerows include:

- Providing food such as blackberries.
- Providing breeding sites. Almost two thirds of Irish bird species nest in hedgerows.
- Providing shelter for animals.
- Acting as a physical barrier to prevent pollution in waterways from fertilisers, pesticides and silt.
- Reducing climate change by acting as a carbon storage site.
- Reducing the risk of flooding by slowing the flow of water.
- Helping pollinators by providing nectar and pollen.
- Protecting animals such as cattle and sheep from rain and by providing shade in hot weather.
- Helping improve air quality in urban areas by catching small particles.

Classroom Activity - Components of a hedgerow

Hedgerows are more than just a line of bushes or shrubs. They may contain tall trees, grass and flowers at their bases, a drain or ditch along their length or a strip of ground called a margin where farmers or owners do not mow or cut. Essentially there are five layers and this game teaches the students about each layer and its location.

Show the students the picture of the hedgerow or better yet go out to a hedgerow which may contain some or all of the components. Explain the different components and the associated actions below.



1. **Tree layer:** These are the trees growing within the hedgerow. They are normally more than 4 metres in height and can be in lines or just one isolated tree. The students must jump up high in the air when you call out 'Tree Layer' whilst stretching their hands up. They must call back 'Tree Layer'.
2. **Shrub Layer:** This is the main part of the hedgerow and it consists of woody shrubs which are less than 4 metres in height. These shrubs usually have many branches and are cut back to maintain their shape. The students must crouch down and do a jazz hands movement when you call 'Shrub Layer' and repeat the name 'Shrub Layer'.
3. **Base Layer:** The ground beneath the hedgerow which may just be soil or may be covered in grasses and other smaller plants. The ground does not need to be flat and can include any mound that the shrubs and trees are growing on. The students must touch the ground with both hands when this layer is called.
4. **Margin:** This is the ground area between the base of the hedgerow and the start of the footpath or part of the field the farmer actively uses. This can be a small strip or up to a metre or two in width. There is often no distinct cut-off point. The students will do a press-up when 'Margin' is called and repeat the word 'Margin'. Their body represents the margin.
5. **Ditch:** Depending on where in Ireland you live this can mean one of two things. A ditch can be the small waterway beside the hedgerow such as a drain or small stream. It can also be used to mean the actual hedgerow itself. Here we will use it to mean a waterway beside a hedgerow. Students will pretend to splash their faces with water when 'Ditch' is called.

Get the student to stand in a circle and begin to call out each component randomly. The students must call back the name and do the correct action. This may wear the students out!

Once they have learned the different components, allow them to have a rest and instead discuss each layer. Ask questions such as:

- Why are the tree and shrub layer important? They provide birds, mammals and insects with nesting sites, shelter and food, and they connect wild areas in the same way our roads connect us to different locations.
- Why are the base layer and margin important? They provide nesting sites for insects, flowers provide nectar and pollen to bees and butterflies, they provide a place for wildflowers to grow and a buffer between the hedgerow animals and plants and the influences of humans.
- Why is the ditch important? It provides the plants and animals with water for growth and quenching thirst. It in itself is a water habitat for many aquatic plants and animals.

Curriculum Links & Integration

Subject	Strand	Strand Unit
Science	Living Things, Environmental awareness and care	Human Life, Plant and Animal Life, Caring for the environment, Environmental awareness, Science and the environment
Geography	Environmental awareness and care	Caring for the environment,
Physical Education	Games	Creating and playing games
English	Oral language	Communicating, Understanding, Exploring and Using

Teacher short-term planning notes

Lesson Plan 1 – What are hedgerows? An introduction to hedgerows and their benefits

Subject:	Geography
Class level:	3rd 4th 5th and 6th
Strand:	Natural Environments
Strand Unit (s):	The local natural environment

Learning Outcomes/Content Objectives:
The child should be enabled to

Third and Fourth Class:
- Investigate and become familiar with some natural features in the local environment
- Observe and explore ways in which these features have affected the lives of plants and animals
- Investigate the ways in which these features have been used by humans and the changes which have occurred as a result

Fifth and Sixth Class:
- Investigate and learn about the main natural features in the locality and county
- Investigate the influence of these features on plants and on the lives of animals and people
- Become aware of the ways in which people, animals and plants have exploited and/or altered these features

Learning Objectives
- Examine the importance of hedgerows as a habitat
- Identify hedgerows in their local environment
- Become aware of the five layers that make up a native hedgerow
- Examine the differences between a native hedgerow and a non-native hedgerow (e.g. laurel hedge)
- Explore the history of hedgerows in Ireland
- Identify the benefits of native hedgerows as a boundary, and compare native hedgerows to other common boundaries (e.g. wall, fence, etc.)

Learning activities
Stimulus: Images of hedgerows

Talk and discussion based on different types of habitat, and specifically hedgerows as a habitat. What is a hedgerow? What is the difference between a native and non-native hedgerow?

Talk and discussion about the history of hedgerows in Ireland. Why do you think hedgerows exist? Who do you think first planted them?

"Components of a hedgerow" classroom activity to enable the children to learn the different components of native Irish hedgerows

Differentiation

Teacher pace

Different levels of questioning can be used accordingly

Pair and group work may be used as necessary

Actions may be altered

Assessment

Self-assessment
Conferencing
Concept mapping
Questioning
Teacher observation
Teacher-designed tasks and tests

Resources
Dún Laoghaire-Rathdown County Council Hedgerow Toolkit for Schools Lesson Plan 1 – What are hedgerows? An introduction to hedgerows and their benefits

Images of different hedgerows. Laurel hedge vs native hedgerow

Access to local hedgerow if possible!

Lesson Plan 2

A hedgerow survey: The flora and fauna of a hedgerow

Introduction

> *Hedgerows are amazing places to explore as they are home to a wealth of biodiversity, including trees and shrubs, flowers, birds, mammals and invertebrates.*

There can be an incredible variety of species packed into a very small area. Some may be obvious such as beautiful flowers, while others may be more secretive like a sheltering frog. It is also really exciting to observe hedgerows as they change throughout the seasons - whether it's primroses arriving early in the year, bumblebees disappearing into their underground nests, beautiful white blossoms of the hawthorn in May or juicy blackberries arriving in autumn. In this lesson plan you will learn to explore hedgerows with your class throughout the year.

If you have a local hedgerow

Classroom Project

This classroom project involves choosing a local hedgerow and studying it throughout the seasons. Choose a hedgerow that is safe and easy to access, either on the school grounds or perhaps in a local park. Check to see what plants are growing in the hedgerow before choosing it with the children. Check the ID guide to see if any of these species grow there. Remember planted hedgerows often contain ornamental or non-native shrubs.

Of course it is still a good idea to use these hedgerows but be aware that you may not find as many species. This in itself is an important lesson for the students. How could they improve the hedgerow?

In addition it would be ideal if the students are able to see their hedgerow during their daily activities. They are more likely to notice any changes throughout the year and this will also instil a greater sense of ownership.

Instructions

These activities can be done in any order. If at all possible, visit your hedgerow once every season or every term. Some of the activities can be repeated to highlight seasonal variations.

Keeping all the hedgerow information in one spot, such as in one section of an SESE copybook, will emphasise the differences throughout the seasons. We would recommend creating a very simple hedgerow notebook. All you need to do is take two sheets of blank A4 paper. Place them on top of one another in landscape format. Fold over the sheets to create a small A5 booklet. You can staple the spine together. This creates an 8 page booklet where the front and back pages can be decorated, leaving room for 6 pages inside.

Activities

1. Scavenger hunt

> *Materials: scarf or small piece of material x2*

This is a great introductory game on arrival at the hedgerow. It encourages the students to look very closely and investigate in a short amount of time.

1. Pick up to eight different objects from in and around the hedgerow. These can include items such as grass, a fallen leaf, acorn, broken twig, stone, etc. Don't let the students see the items. Also, it is important to respect the hedgerow and not pick items that could damage the habitat. For example, do not pick flowers but instead items that are readily available and easily placed back, such as fallen leaves.
2. Place these items on the footpath or onto a plain piece of material - a scarf works well. Leave spaces between the items so they are easily distinguished from each other.
3. Cover the items with another piece of material.
4. Pair the students up. One student will be briefly shown the items and they must relay what they saw to their partner. One student from each pair may come up and stand close to the covered items.
5. Reveal the items to the students for approximately 10 seconds and then cover them up. The students must go back to their partner and name what they saw. The pair must now look for all the items. Remember to emphasise that the students need to respect the hedgerow and cause no damage.
6. Once the students have collected up all the items they will form a circle around the covered items. The items will be revealed one by one and the students will show if they found them. They will need to return all objects carefully at the end.
7. This is a good opportunity to discuss some of the more important hedgerow items such as berries and leaves which will help with their identification skills.

2. Sound mapping

> *Materials: none*

It may not seem like hedgerows are home to many animals but this is usually because they are overlooked. This is a very simple activity but it is great at calming and connecting the students to their local wildlife.

1. Sit on the ground for five minutes. Try to be as quiet as possible. Close your eyes and note what you can hear.
2. Discuss what you can hear. Did they hear any birds, the wind blowing through the trees and shrubs, the crunch of leaves as people walked past, etc.

3. Hedgerow Survey

> *Materials: Hedgerow ID chart (see page 34), clipboards, pencils, camera or iPad, hedgerow mini-notebook/SESE copybook/paper*

1. Before visiting the hedgerow, use the ID chart and discuss the various plants and animals the students may see.
2. Place the students in groups of four. Assign each student a specific job:
   a. Project manager - oversees the project, resolves conflict and ensures everything is completed on time
   b. Recorder - records all of the information gathered and ensures everyone in the group understands where the information came from
   c. Equipment manager - checks materials available, decides on quantities used and ensures they are collected and returned
   d. Spokesperson - encourages everyone in the group and presents the project to the class
3. Assign each group a section of hedgerow. The size of the section depends on the length of the hedgerow and so can be as long as 10 paces.
4. Each group must complete some or all of the following tasks. All of these tasks could include making drawings or taking photographs.
   - Identify and record any plants using the ID chart. Do a tally of one or two plants to see how many are in the length of the assigned hedgerow. Older classes could note down any plant adaptations such as thorns for protection against grazing animals, twisting stems for climbing or any seed dispersal methods such as by wind, or through attracting birds etc.

- Note down and record any evidence of animals. Did they actually see any animals? Animal signs or evidence include half-eaten berries, chewed nuts, poo (!), nests etc.
- Older classes could record the abiotic (non-living) factors. These would include how sunny the area is, are there a lot of cars driving by or people walking by, is the soil wet or very dry etc. How big are the margins? The abiotic factors affect the plants and animals that live there. For instance a hedgehog might not want to live beside a very busy footpath or some plants may be smaller if they are near a busy road. Allow the students to think about how their hedgerow may be affected.

4. Leaf Rubbing & Printing

Materials: paper/SESE copybook/ hedgerow mini-notebook, crayons OR paint, paper and a hard book

1. Pick a leaf off a hedgerow shrub or tree or pick one up from the ground. Ideally try to pick a leaf that really represents your shrub or tree – one that isn't missing a piece or is too misshapen.
2. Place the leaf onto a hard flat surface. Cover with the paper. It is better to use the rough side of the leaf, usually the underside, so have this part of the leaf touching the paper. Rub the paper with a crayon. Again, using the side of a chunky crayon gives the best results.
3. This can be turned into an art activity by using paint instead of the crayon. Paint directly onto the leaf and press the painted side onto the paper. Cover with a hard book and press, being careful not to move the book around as it will blur the image. Using white paint and printing onto black paper works very well too.

5. Hedgerow Sketch

Materials: pencil, paper/SESE copybook/ hedgerow mini-notebook

Scientists use drawings to record real objects and it is an important skill in the natural sciences. It is different from artistic drawing as they must be simple and accurate – there is no room for artistic flare here! Students who don't think they are 'good' at art can still successfully create scientific sketches as long as their sketch records the hedgerow accurately and communicates clearly through the use of labels. Remind the students of the different components of the hedgerow (Lesson 1) and if there is time, play a quick game calling out the layers.

Outline sketch of the hedgerow

1. Pick a spot far away from the hedgerow, ideally somewhere the students can sit down. Mark out a small length of the hedgerow as some students may attempt to sketch a large area and may not have time to complete it. One or two metres is enough.
2. Discuss the hedgerow. How many layers does it have? How wide is the margin? Are there any trees? Are these trees in a line or isolated? Are there any plants growing along the base? Is there a ditch? Are there aquatic plants growing in the ditch? Can you spot any plants that have modifications such as twisting stems or thorns?
3. Now draw the section of hedgerow. Label the layers and what else you can see. It is best to imagine that you are drawing this hedgerow for someone who has never seen it before.

Bud/ Tree/ Flower/ Seed Sketch

As you visit your hedgerow throughout the year you will see lots of changes; leaves appearing from buds to flowers turning into seeds. Therefore, the following sketches are designed to be spread out through the school year.

1. Visit your hedgerow in autumn. Are there seeds on the trees or shrubs such as rosehips, haws on the hawthorn or beech nuts? Have a very close look at them. Perhaps you can find some on the ground. Sketch them.
2. Visit your hedgerow in winter. Have all the leaves fallen off the trees and shrubs? If not, which ones have kept their leaves? Most often all that remains on the branches will be tightly stored leaves ready to burst next spring. These little capsules are called buds. Take a close look at them. Are they sharp or round? Are they dry or sticky? What colour are they? How are they arranged on the twigs? Sketch them.
3. Visit your hedgerow in spring. The buds should have burst and the leaves unrolled. What shape are the leaves? How do they feel? Sketch them. Listen quietly for birdsong.
4. Visit your hedgerow in summer. Have flowers emerged at the base or along the margin? What colour are they? What shape are they? Does anything visit the flower during your observation? Explore them closely and sketch them.

6. Hedgerow minibeasts

Materials: paper/SESE copybook/hedgerow mini-notebook, pencil, large white sheet, basins (one for each pair of students). Additional extras: pooters, pond dipping nets

Hedgerows are home to many different species such as lichens, birds, squirrels and minibeasts. Try to find and identify some of the minibeasts in each of the hedgerow components. Even if you cannot name them, this is a good exercise in demonstrating how many species use your hedgerow. Many minibeasts hibernate or spend the cold winter months as pupae or eggs so it is best to avoid doing this activity in the winter months.

Tree sheet shake

1. Spread out a white sheet and get the students to hold the edges taut. Do not allow the students to shake the sheet as the minibeasts will bounce off if they do.
2. Stand below the tree under a low hanging branch. Ask the students to stand still and to hold the sheet steady. The teacher should shake the branch very lightly without causing damage. Watch how many minibeasts fall onto the sheet. Emphasise the importance of respecting the tree and not doing anything that will harm the tree
3. Place the sheet carefully onto the ground to watch and if possible identify them. Discuss any camouflage. Highlight how important it is to let the minibeasts go free.
4. Record what was found - either list the names or draw some mini-beasts.
5. Additional: Do the same under other trees to compare the minibeasts present. Try at different times of the year to compare. It is important to discourage students from trying to shake branches themselves as they can very easily damage the tree and harm the creatures living in it, only the teacher should shake the tree.
6. Return all mini-beasts unharmed once the activity is completed.

Basin/ Beating Tray

1. Pair the students and give each pair a basin. They need to find one short stick on the ground. Each pair must hold their basin underneath the shrub layer and gently tap the plants with their stick. It is important that the students act like real scientists and respect the habitats they are examining and do not cause any damage. Mini-beasts will fall into the basin. Did they find the same mini-beasts as from the sheet shake? If they were different why do they think that was the case?
2. Return all mini-beasts unharmed once the activity is completed.

Additional activities: Pooters could also be used to find and catch small mini-beasts living in the hedgerow. Small fishing nets or dipping nets could be used if there is a ditch to catch aquatic mini-beasts. Make sure there is a basin of water (water from the ditch) nearby where any mini-beasts caught can be placed and observed.

If you don't have a local hedgerow – let's use our imagination !

1. Hedgerow Food web

> *Materials: balls of string, pens, flashcards, large lightweight ball, scissors.*

Lesson: Ask the students to write down all the species they might find in a hedgerow including everything from flowers to mammals. They could do this in pairs or groups. Write some of the answers on the board and discuss with the students what species depend on each other for survival. Construct a simple food chain on the board using an example such as Flower - Slug - Robin. Can the students create another example? Explain that when you mix a number of food chains together you create a food web. A food web of a hedgerow will demonstrate the transfer of energy from one species to another. Assign each student a species (examples below). They must write this on their flash card. Get the students to stand in a large circle (preferably outdoors), holding their flashcards. Start to create food chains between the students and their assigned species. These food chains will begin to overlap to create food webs. You could use separate pieces of string or one continuous length. The string will be passed around in all directions and begin to form a large criss-crossed web of life. This pattern demonstrates the complexity in the hedgerow and what gives biodiversity its strength. Throw the inflatable ball onto this web to demonstrate how it supports life by keeping the ball raised. Discuss what might happen if you remove important species. Do this by specific students dropping the string or cutting the connections with scissors. What will happen to the ball?

Example species: Dandelion, Daisy, Herb Robert, Primrose, Nettle, Slug, Snail, Ladybird, Bumblebee, Hoverfly, Butterfly, Moth, Fly, Centipede, Millipede, Hedgehog, Mouse, Badger, Fox, Bat, Robin, Blackbird, Wren, Buzzard, Kestrel, Mushroom, Ash, Holly, Hawthorn, Oak, Frog.

2. Make Your Own Hedgerow Collage

> *Materials: recycled materials, unused scrap art materials, paint, glue, sellotape and any other materials the students think might help them create their collage.*

Prior to the lesson: Collect up recycled materials and unused art materials such as pieces of plastic bags, crepe paper, cardboard, etc. Make all the materials accessible to the students during this activity along with glue, sellotape, paint, etc.

Cut up a large box or make a large strip of cardboard for each group so that when each component is complete they can be put together to create one large image of a hedgerow.

Divide the class into groups. Assign each group a component of the hedgerow: Tree layer, shrub layer, base, margin and ditch. Give the students time to think about how they will make their section and give them time to collect up any additional materials at home.

Lesson: Each group must create their component using the art materials provided. For instance the 'ditch group' might create their water out of old blue plastic bags torn up, make their aquatic plants from strips of old green card, create frogspawn from bubblewrap, etc.

Combine all the hedgerow components together. Discuss how each group has made their component and label the layers.

3. Hedgerow Who Am I?

Can the students identify some common hedgerow plants? This is a good assessment activity to see how much the children know and can be used prior to other activities in this section or afterwards to see how much they have learned.

> *Materials: statement sheet for each student, pencils, strips of paper, answer sheet for teacher.*

Print out enough statement sheets for each student in the class and get them to paste them into their SESE copybook. The teacher will write the answers onto separate strips of paper and stick them randomly onto the walls around the classroom.

Divide the students into pairs or small groups. Example statements and answers:

Statement	Answer
1. I have thorns on my stems and provide animals and humans with juicy black berries in autumn.	C. Bramble
2. I have beautiful flowers which turn into red berries called hips in autumn.	A. Dog-rose
3. I am known as the fairy tree and it is thought to be bad luck to cut me down.	B. Hawthorn

Assign each pair a different statement to begin on so that not all students are looking for the same answer at the same time.

Set a timer on the board or use an egg timer - the time will depend on the students ability but 10 minutes may be enough.

Correct and discuss answers at the end.

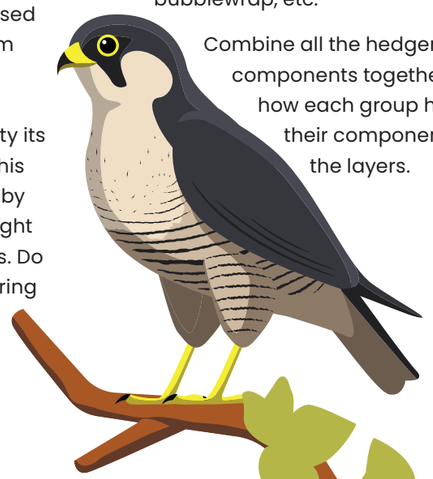
4. Can the school plant a wildlife hedge if they have a green space?

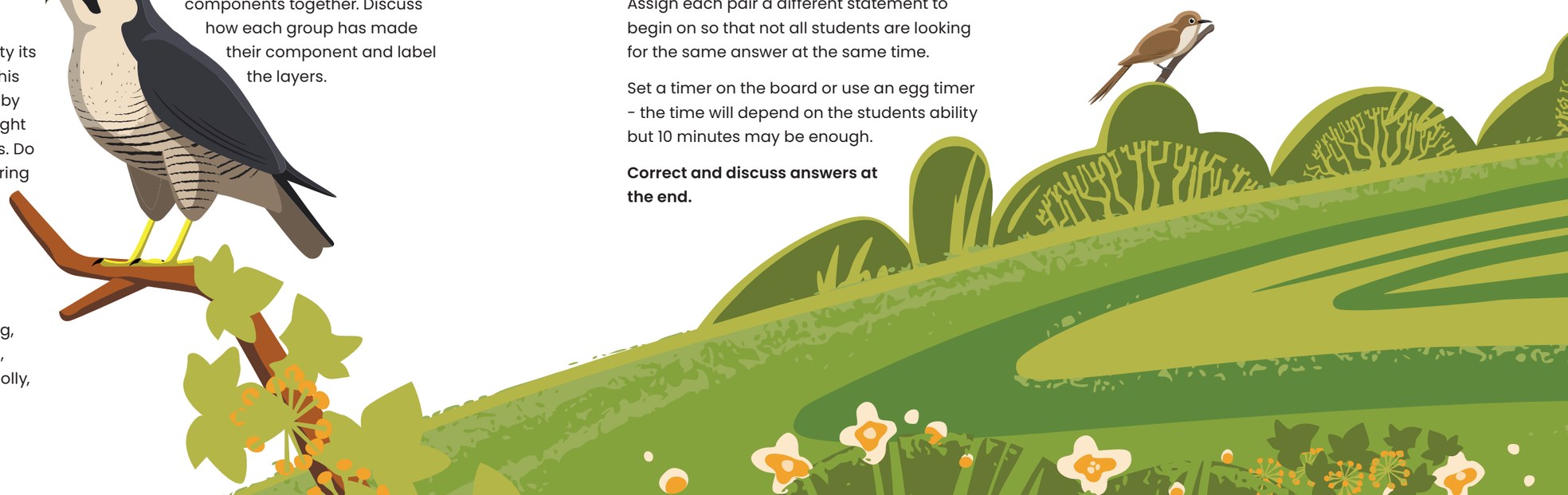
This is great if the school doesn't have wildlife habitat, or to make a wildlife corridor between existing planted areas. It is best to use a mix of native tree and shrub species such as ash, oak, hazel, hawthorn, wild cherry, crab apple, holly, rowan, honeysuckle, and elder. Willow and alder are good in places that get waterlogged. Try to source plants grown from native Irish seeds or collect them from under trees in the local area. See http://www.nativewoodlandtrust.ie/en/learn/gathering-seed for advice on growing seeds of Irish trees.

Links to Biodiversity theme in Green Schools programme. (Note: please observe appropriate health and safety precautions and only access land with permission).

Taken from the Heritage in Schools Programme

http://www.heritageinschools.ie/content/resources/The%20River%20Nore/The_River_Nore_Lesson_Plan_4_Hedgerows.pdf





Curriculum Links & Integration

Subject	Strand	Strand Unit
Geography	Environmental awareness and care, Natural Environments	Environmental awareness, The local natural environment
Science	Environmental awareness and care	Caring for the environment, Environmental awareness, Science and the environment
Visual Arts	Drawing	Making drawings, Looking and responding
S.P.H.E	Myself and the wider world	Developing citizenship
English	Oral language, Writing	Communicating, Understanding, Exploring and Using

Teacher short-term planning notes

Lesson Plan 2 – A hedgerow survey. The flora and fauna of a hedgerow

Subject:	Science
Class level:	3rd and 4th 5th and 6th
Strand:	Living things
Strand Unit (s):	Plant and animal life

Learning Outcomes/Content Objectives:

The child should be enabled to

Third and Fourth Class:

- Observe, identify and investigate the animals and plants that live in local environments
- Observe and explore some ways in which plant and animal behaviour is influenced by, or adapted to, environmental conditions
- Discuss simple food chains
- Use simple keys to identify common species of plants and animals
- Come to appreciate that animals depend on plants and indirectly on the sun for food
- Sort and group living things into sets according to observable features

Fifth and Sixth Class:

- Observe, identify and examine the animals and plants that live in local habitats and environments
- Observe and explore some ways in which plant and animal behaviour is influenced by, or adapted to, environmental conditions
- Recognise that there is a great diversity of plants and animals in different regions and environments
- Identify the interrelationships and interdependence between plants and animals in local and other habitats
- Construct and use simple keys to identify locally occurring species of plants and animals
- Group and compare living things into sets according to their similarities and differences

Learning Objectives

- Develop respect and appreciation for local natural habitats
- Investigate local hedgerow and begin to recognise different items that exist in this habitat
- Become aware of the sounds that can be heard in a hedgerow
- Observe and identify plants and animals who make hedgerows their homes. Record and represent information gathered (lists, drawings, etc.)
- Create leaf rubbings and prints to identify and record hedgerow flora
- Make scientific drawings of hedgerows from observation, and label the layers
- Examine simple food chains that exist in our local environment, and identify species that depend on one another
- Explore the food web of a hedgerow, and develop an understanding of the transfer of energy from one species to another

Learning activities

Talk and discussion about the importance of being respectful to all plant and animal life while studying a local hedgerow.

Create a hedgerow notebook. Take 2 sheets of A4 paper, place them on top of each other and fold them to create an 8 page A5 size notebook. Staple the spine if needed. Design the front and back cover with your favourite hedgerow plants and animals!

Classroom Project:
Choose and study local hedgerow by completing the following activities;

- Scavenger Hunt
- Hedgerow Survey
- Leaf rubbing
- Hedgerow Sketch
- Minibeasts

If there is no access to local hedgerow. Complete the following activities in class to explore the world of the native hedgerow.

- Hedgerow Food Web
- Hedgerow Collage
- Hedgerow Who am I?

Differentiation	Assessment
Teacher pace Different levels of questioning can be used accordingly Pair and group work may be used as necessary Varying level of teacher support The children have opportunities to provide different outcomes while working on the same task	Self-assessment Conferencing Concept mapping Questioning Teacher observation Teacher-designed tasks and tests

Resources
Dún Laoghaire-Rathdown County Council Hedgerow Toolkit for Schools Lesson Plan 2 - A hedgerow survey. The flora and fauna of a hedgerow

Scavenger Hunt: scarf or small piece of material x2

Hedgerow Survey: Hedgerow ID chart, clipboards, pencils, camera or iPad, hedgerow mini-notebook/SESE copybook/paper

Leaf rubbing: paper/SESE copybook/hedgerow mini-notebook, crayons OR paint, paper and a hard book

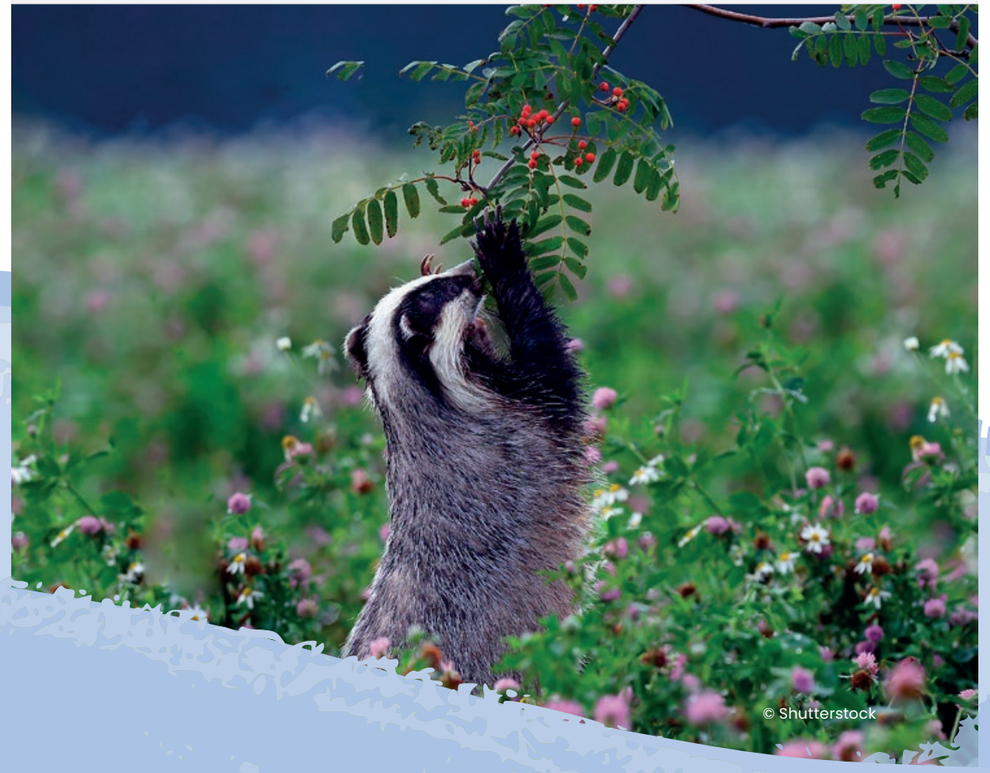
Hedgerow Sketch: pencil, paper/SESE copybook/hedgerow mini-notebook

Minibeasts: paper/SESE copybook/hedgerow mini-notebook, pencil, large white sheet, basins (one for each pair of students). Additional extras: pooters, pond dipping nets

Hedgerow Food Web: balls of string, pens, flashcards, large lightweight ball, scissors.

Hedgerow Collage: recycled materials, unused scrap art materials, paint, glue, sellotape, etc.

Hedgerow, Who am I?: statement sheet for each student, pencils, strips of paper, answer sheet for teacher.



Statement	Answer
1. I have thorns on my stems and provide animals and humans with juicy blackberries in autumn.	Bramble
2. I have beautiful flowers which turn into red berries called hips in autumn.	Dog-rose
3. I am known as the fairy tree and it is thought to be bad luck to damage me. I have white flowers which turn into red berries called haws in autumn.	Hawthorn
4. I am a mammal. My name in Irish is ‘madra rua’.	Fox
5. I am a climbing plant that twists my vines around trees and other plants. My creamy-yellow flowers smell very sweet and they attract moths at night.	Honeysuckle
6. I am one of the first wildflowers to appear in spring. My flowers are usually yellow but can sometimes be pink.	Primrose
7. I am a large mammal with large black and white stripes on my head. I am nocturnal and live in a sett.	Badger
8. I am a native Irish tree that produces yummy nuts in autumn. In ancient Ireland I was known as the Tree of Knowledge.	Hazel
9. I am an evergreen climbing plant. You’ll see me climbing up trees and walls. My leaves are a dark glossy green, my flowers are important for pollinators and my black fruits are eaten by birds throughout the winter.	Ivy
10. I am one of Ireland’s smallest birds. I like to stick my tail up when I am not flying. I am very light and weigh 10g, just less than two 20c coins!	Wren
11. I am one of Ireland’s most distinctive birds with my red chest. I am one of the only birds in Ireland to sing throughout the winter.	Robin
12. I am a beautiful insect and was once a caterpillar. There are 35 species of us in Ireland.	Butterfly
13. I am a very prickly mammal with 5000 spines all over my body. When I’m scared I can roll into a ball.	Hedgehog
14. I am a native tree that usually likes to grow in damp ground. In spring I produce catkins.	Willow
15. I pollinate plants and make a buzzing noise! There are 99 wild species of us in Ireland.	Bee
16. I have eight legs and I make a silk web to catch my food.	Spider
17. I am a bird whose eggs are light blue with red speckles. The female has brown feathers but the male has black feathers, a bright yellow bill and a yellow ring around his eye.	Blackbird
18. In ancient Ireland I was known as a Noble of the Woodland. I am a deciduous tree and I produce acorns which are eaten by squirrels and jays.	Oak

Print this page for students. To be environmentally friendly, please only print pages of this guide where necessary.

Statement	Answer
1. I have thorns on my stems and provide animals and humans with juicy blackberries in autumn.	
2. I have beautiful flowers which turn into red berries called hips in autumn.	
3. I am known as the fairy tree and it is thought to be bad luck to damage me. I have white flowers which turn into red berries called haws in autumn.	
4. I am a mammal. My name in Irish is 'madra rua'.	
5. I am a climbing plant that twists my vines around trees and other plants. My creamy-yellow flowers smell very sweet and they attract moths at night.	
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18. In ancient Ireland I was known as a Noble of the Woodland. I am a deciduous tree and I produce acorns which are eaten by squirrels and jays.	

Answers below to be photocopied, cut out and stuck on walls by teacher. Alternatively they can be written on the board or projected onto the whiteboard.

Bee	**Hawthorn**
Ivy	**Hedgehog**
Spider	**Wren**
Fox	**Bramble**
Hazel	**Willow**
Butterfly	**Oak**
Robin	**Blackbird**
Honeysuckle	**Primrose**
Dog-rose	**Badger**

Lesson Plan 3

Why hedgerows need help. Learn about connections and fragmentation

Introduction

Show two aerial images of farmland, and one of urban Dún Laoghaire-Rathdown - one with lots of hedgerows and another without. Discuss the images in the context of the animals and plants studied in Lesson 2. Are there any issues?

Hedgerows are themselves valuable habitats, but they also allow animals to travel to and from other habitats such as woodlands. In many ways hedgerows are a secret roadway that animals travel on, safely hidden from predators and humans. Indeed hedgerows are often called 'wildlife corridors' and are used in the same way that the corridors in your school connect you to other classrooms, the gym and your school yard. How would you feel if someone decided to knock down one of the corridors in your school and built a wall which stopped you from getting to the gym for your PE lesson? Or they built a road through another corridor where the cars drove so fast you couldn't get to your yard safely?

This is often what happens to animals when hedgerows are knocked down or replaced by some other boundary such as a fence or wall. This is called 'habitat fragmentation'; when the hedgerow habitat is broken up into small pieces or fragments. It reduces connectivity so animal species like foxes, badgers and hedgehogs become disconnected and isolated. This can lead to them dying out in one area, whereas before they would have used the hedgerows to find mates, food or shelter by using the hedgerow as a wildlife corridor.

This is a bit like how you might feel if your phone couldn't connect to the internet. You would soon start to feel disconnected from your friends!

If hedgerows are so important, why are they removed, and not planted or maintained so there are not big gaps in them? On farmland, hedgerows can prevent large machinery moving easily in fields, so farmers may remove them to make their fields larger.
In urban areas, hedgerows take more maintenance than a fence or wall as they might need to be cut or mown under. Building new roads and homes may lead to their destruction or a big gap between hedgerows.

Ask the students: what could be done?

Is this an issue in your locality? Show an aerial image of a location in DLR. Can you see any hedgerows, any wildlife corridors? How does this affect our local biodiversity? Discuss how important it is to create and maintain these connections.

Class Activity

Provide pairs or groups with a new map. Ask them to assess the map - where would they live if they were a hedgehog? Discuss as a class and decide one location.

Provide a scenario: There is not enough food for all the hedgehogs in the habitat they have chosen. They must find their own new habitat. How will they get there? Each pair or group must work on this and try to do so in as safe a manner as possible, by avoiding roads, hiding in hedgerows, etc. They must mark their route.

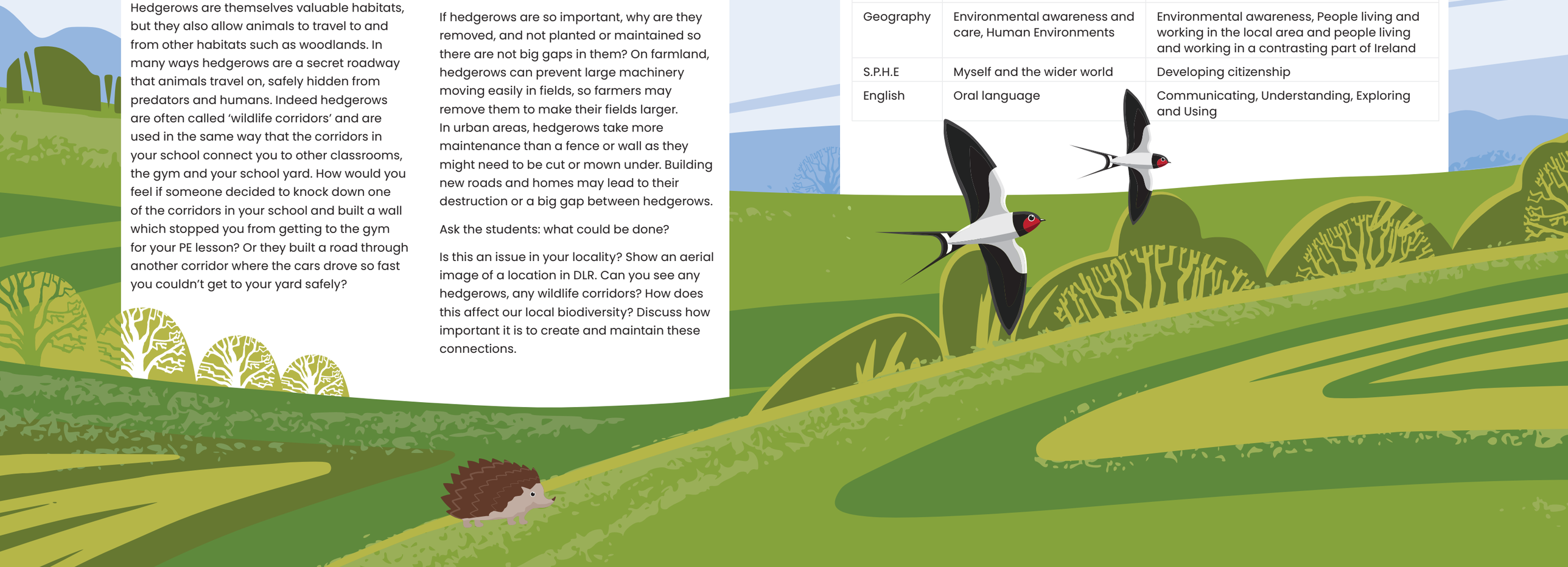
Discuss as a class afterwards. Identify locations where a hedgerow would have helped.

Using Google, Bing or another mapping website, find the school grounds and surrounding area. Display on the IWB. Identify hedgerows and other habitats. Discuss how the school could improve their grounds to help animals and plants. Identify where hedgerows could be planted.

Extension: Could the children campaign to plant native hedgerows at the school or nearby? How could they raise funds? Could they make posters to persuade the principal and other children?

Curriculum Links & Integration

Subject	Strand	Strand Unit
Science	Living Things, Environmental awareness and care	Plant and Animal Life Caring for the environment, Environmental awareness, Science and the environment
Geography	Environmental awareness and care, Human Environments	Environmental awareness, People living and working in the local area and people living and working in a contrasting part of Ireland
S.P.H.E	Myself and the wider world	Developing citizenship
English	Oral language	Communicating, Understanding, Exploring and Using



Teacher short-term planning notes

Lesson Plan 3 – Why hedgerows need help. Learn about connections and fragmentation

Subject:	Geography
Class level:	3rd and 4th 5th and 6th
Strand:	Environmental awareness and care Natural Environments
Strand Unit (s):	Caring for the environment The local natural environment

Learning Outcomes/Content Objectives:
The child should be enabled to

Third and Fourth Class:

- Examine a number of ways in which local and other environments could be improved or enhanced
- Identify and discuss a local, national or global environmental issue
- Realise that there is a personal and community responsibility for taking care of and conserving environments
- Investigate and become familiar with some natural features in the local environment
- Observe and explore ways in which these features have affected the lives of plants, animals and humans
- Investigate the ways in which these features have been used by humans and the changes which have occurred as a result

Fifth and Sixth Class:

- Come to appreciate individual, community and national responsibility for environmental care
- Identify and discuss a local, national or global environmental issue
- Examine a number of ways in which local and other environments could be improved or enhanced
- Investigate and learn about the main natural features in the locality and county
- Investigate the influence of these features on plants and on the lives of animals and people
- Become aware of the ways in which people, animals and plants have exploited and/or altered these features

Learning Objectives

- Examine contrasting aerial images and identify differences
- begin to recognise the important role played by hedgerows as 'wildlife corridors'
- Explore what is meant by 'habitat fragmentation'
- Discuss what could be done (or not done!) to avoid habitat fragmentation
- Assess and use maps to record routes
- Use digital mapping tools to locate existing hedgerows and to identify suitable areas to establish new hedgerows

Learning activities
Stimulus: Aerial images of rural and urban environments with varying extent of hedgerows.

Talk and discussion based on the images, with the context being: the importance of hedgerows for plants and animals. Drawing on material learned in lesson 2, can you identify any issues?
Discuss the importance of hedgerows as a way for animals to travel safely. How does fragmentation affect this?

Mapping activity: Examine map and identify the best home for a hedgehog. Could a hedgehog move safely from there to another point on the map? Mark your route. What would the dangers be? How could we help the hedgehog and make it safer?

Extension activity: Organise a campaign to plant a native hedgerow on school grounds or in your local environment.

Differentiation
Teacher pace

Different levels of questioning can be used accordingly

Pair and group work may be used as necessary

Varying level of teacher support

Assessment
Self-assessment
Conferencing
Concept mapping
Questioning
Teacher observation
Teacher-designed tasks and tests

Resources
Dún Laoghaire-Rathdown County Council Hedgerow Toolkit for Schools Lesson Plan 3 - Why hedgerows need help. Learn about connections and fragmentation

IWB - Maps (Google, Bing, etc.)

Printed map for each group

Markers

Poster making materials (extension activity)

Lesson Plan 4

How can we help hedgerows? What a good hedgerow looks like.

Introduction

Having any sort of a hedgerow is better than having none, but there are some ways hedgerows can be improved to help biodiversity.

For instance, the bigger and denser the hedgerow, the better it is for birds. Birds like to be well hidden from predators, especially if they have built a nest. The structure is also important. A lot of birds and small mammals, such as mice and hedgehogs, prefer the base to be covered thickly with plants so they cannot be spotted by predators, whilst taller trees are great for some birds. What plants the hedgerow consists of is very important too. If the hedgerow only contains hawthorn then only certain animals will live there, whereas if there is a huge variety of native plants such as honeysuckle, hawthorn, ivy, blackthorn, etc, it means the hedgerow will provide a range of food and shelter throughout the year. For instance, having a native willow tree or shrub will attract up to 400 insect species! A ditch will of course attract aquatic species also, such as frogs and newts. Every hedgerow component plays an important role!

Class Activity - Stakeholder Debate Activity

Materials: new school plans/map, stakeholder cards printed out and cut up.

- Show the class a new school that is being built locally (not really!). Study the plans on the IWB and briefly discuss the school grounds and how they could be developed with biodiversity in mind.
- Highlight the area between the school grounds and the housing estate. This needs a boundary and they are going to decide which type of boundary is best.
- Divide the students into groups of four or five. Write the stakeholder roles on the board, but do not give any details, e.g. Property developer, Tidy Towns group, Residents Association, etc. Assign each group a stakeholder role.
- Provide each group with their stakeholder card outlining their stance on the boundary.
- Give ten minutes for each stakeholder group to discuss their position - they need to focus on the reasons behind their decision and any possible counter arguments other groups may use on them.
- Ask each group to present their arguments to the whole class. Leave it open for discussion and questions.
- Discuss with the class how important hedgerows are, how easily they are overlooked and ignored, and how the students can help.

Stakeholder Roles:

1. **Property Developer**
   You need to complete the development on time and on budget. You want the quickest and most efficient option. You propose putting a tall fence between the school and the houses.
2. **Tidy Towns Group**
   You want to make sure wildlife has a home in the community. You would like somewhere to put up bird boxes and bat boxes. You propose a native hedgerow with some trees.
3. **Principal**
   You want to make sure the children are safe while playing out in the yard. You don't want the children to lose their football in the neighbouring gardens. You propose a tall wall with a metal fence on top.
4. **Residents Association**
   You want to look after nature and have something nice to look at but also something that is quick and easy to maintain. You don't want children climbing into your garden to get their footballs. You propose a tall metal fence and a non-native hedgerow that is easy to cut.
5. **County Council**
   You want to boost biodiversity in the local area and are unhappy that a number of hedgerows were removed in order to build the school. You propose a native hedgerow with a wide margin at the base and a line of native trees.
6. **Students Council**
   Your school is now working on the fifth Green Flag for Biodiversity and you want to improve on and increase the school's biodiversity. You propose a native hedgerow with only one or two trees.
7. **Student Wildcard**
   You are the only stakeholder group that gets to decide what you would like to do! Would you like a fence, a wall, a native hedgerow or a non-native hedgerow?

Curriculum Links & Integration

Subject	Strand	Strand Unit
Geography	Natural Environments; Human Environments	The local natural environment; People living and working in the local area and people living and working in a contrasting part of Ireland
Science	Living Things, Environmental awareness and care	Plant and Animal Life Caring for the environment, Environmental awareness, Science and the environment
S.P.H.E	Myself and the wider world	Developing citizenship
English	Oral language	Communicating, Understanding, Exploring and Using

Teacher short-term planning notes

Lesson Plan 4 – How can we help hedgerows? What a good hedgerow looks like.

Subject:	Geography
Class level:	3rd and 4th 5th and 6th
Strand:	Environmental awareness and care Natural Environments
Strand Unit (s):	Environmental awareness Caring for the environment

Learning Outcomes/Content Objectives:
The child should be enabled to

Third and Fourth Class:

- Identify, discuss and record aspects of local natural and human environments which are considered attractive or unattractive
- Identify the interrelationships of living and non-living elements of local and other environments
- Recognise and investigate human activities which may have positive or adverse effects on local and wider environments
- Recognise how the actions of people may have an impact on environments
- Examine a number of ways in which local and other environments could be improved or enhanced
- Identify and discuss a local, national or global environmental issue
- Realise that there is a personal and community responsibility for taking care of and conserving environments

Fifth and Sixth Class:

- Identify, discuss and appreciate attractive and unattractive elements of natural and human environments
- Explore some examples of the interrelationship of climate, natural features, flora, fauna and human life in different environments in Ireland and in some of the main climatic regions of the world
- Recognise and investigate aspects of human activities which may have positive or adverse effects on environments
- Examine a number of ways in which local and other environments could be improved or enhanced
- Identify and discuss a local, national or global environmental issue
- Come to appreciate individual, community and national responsibility for environmental-care

Learning Objectives

- Recognise and discuss the importance of native hedgerows
- Examine plans for an imaginary new school. Discuss what could be implemented to help biodiversity
- Ask questions about the natural and human environments and their interrelationships
- Develop awareness of the possible challenges faced when trying to promote nature-friendly solutions (i.e. not all stakeholders will agree!)
- Begin to appreciate that local communities have responsibility for environmental care and that their voice is not only important but can make a tangible difference

Learning activities

Talk and discussion recapping all that they have learned about hedgerows in the previous lessons.
Questioning: Can you remember the different components of a native hedgerow? What plant life might you find in a hedgerow? What animal life might you find in a hedgerow? How can we help maintain or establish hedgerows? Are native hedgerows better for biodiversity than non-native hedgerows? Why?

Stakeholder Debate activity: Allow the children the opportunity to take on different stakeholder roles and debate the boundary being established for a new imaginary school. Present their arguments to class. Allow for additional whole class discussion around the benefits of the different types of boundary (native hedgerow, non-native hedgerow, wall, fence, etc.)

Differentiation

Different levels of questioning can be used accordingly

Pair and group work may be used as necessary

Teacher pace

Varying level of teacher support

Assessment

Self-assessment
Conferencing
Concept mapping
Questioning
Teacher observation
Teacher-designed tasks and tests

Resources
Dún Laoghaire-Rathdown County Council Hedgerow Toolkit for Schools Lesson Plan 4 - How can we help hedgerows? What a good hedgerow looks like.

IWB

New school plans/map

Stakeholder cards printed out and cut up

dlr Biodiversity

The Benefits of our Hedgrows

Reduce pollution

Reduce Noise

Crop protection

Wood fuel

Shade

Shelter

Flood control

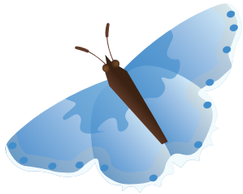
Pest control

Wildlife

Pollinators

Soil protection

The Value and Benefits of our Hedgerows



Our Wildlife Corridors and Networks

Hedgerows and their associated field margins or ditches occur across our county and are crucial for biodiversity, with so many species using them, such as plants, birds, bats, insects, badgers, hedgehogs and much more. Of the 110 bird species regularly recorded in the Countryside Bird Survey during the breeding season in Ireland, 55 use hedgerows. Hedgerows are important for the long-term survival of many species, acting both as corridors – providing connectivity to important habitats and to the wider landscape – and offering both food sources and nesting sites for many species. Hedgerows provide habitats for many of our native flora, such as the primrose. Flora in turn provide food sources, such as blackberries on bramble for birds, badgers and other fauna.

Water Quality and Flood Control

Water infiltration – plant roots help soils absorb water faster. This allows the soil to act like a sponge, soaking up flood water rather than allowing it to run off the land quickly and cause floods. Tree and hedgerow roots run deep, allowing a larger, deeper area of the soil profile to act like a sponge, thus absorbing more water. The soil under a hedge stores more water, and stores it faster, preventing and delaying its movement downslope.

Water uptake – trees and shrubs remove water from soils by absorbing and releasing it back into the air as vapour via the leaves (transpiration).

Reducing sediment in waterways – waterways that become clogged with sediments and pollutants are more prone to flooding. Much of the sediment in our waterways is carried from the land. Hedgerows and hedgerow trees help prevent soil erosion and stop sediments reaching our streams and rivers.

Slowing flood water – by slowing water flow, trees reduce the impact of flooding, allowing more time for soil infiltration, and time to respond to flood warnings.

Pollution – hedgerows reduce the amount of fertiliser and pesticides that reach watercourses. They act as a physical barrier, increasing infiltration to the soil, and recycle nutrients through the trees, shrubs and other plants. They also improve air quality by capturing pollution particles.

Climate Change and Carbon Storage

Carbon storage – hedgerows store carbon above and below ground, and so can help us in our fight against climate change. They store carbon in the woody growth above ground and in roots, leaf litter and other soil organic matter at and below ground level. Hawthorn and blackthorn, which are common in Irish hedgerows can contain about 48.3% carbon on average.

Air Pollution and Heat – Hedgerows can absorb air pollution and dust particles, such as from car exhaust fumes, cleaning the air. Hedgerows can also absorb heat, providing a cooling effect and provide shade under their trees during warm weather.

Heritage and a sense of place

Hedgerows are a defining feature of our countryside, with significant cultural and historical importance. They tell the story of our land boundaries and our faming traditions over many centuries and add to our county's distinctiveness. They make areas more attractive and contribute to our mental health and wellbeing.

Noise Pollution

In urban areas, there are many unwanted sounds, such as noise from traffic, industrial activities, farm machinery and other human activities. Hedgerows and trees can help to reduce noise from surrounding areas and provide the more pleasant sounds of birds singing and bees humming.

Farming

Wind damage – hedgerows provide a wind break and increase crop yields by reducing damage from strong winds, such as: crop lodging which makes them much more difficult to harvest and dramatically reduces yield; premature flower and fruit shedding; shoot damage; and wind chill damage.

Crop pest reduction – hedgerows increase populations of predator and parasitic species of crop pests. Farmland birds and predatory invertebrates, such as spiders, beetles and wasps, all limit crop pests.

Pollinators – hedgerows help support diverse pollinator populations, essential for crop pollination and good crop yields. Hedgerows provide food for pollinators throughout the year when crops aren't in flower, as well as places to nest.

Shelter – livestock without shelter require more food and face higher mortality. Shelter increases lamb survival rates, reducing the effect of wind chill and hypothermia.

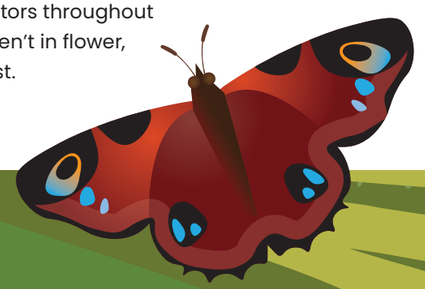
Shade – in the summer months, heat stress reduces milk yield in dairy herds and affects fertility, growth rates and disease resistance. Hedgerows provide places for livestock to find shade.

Diet diversity – supplementary feeding on native hedgerow plants can increase livestock gut microbial diversity, help immune function, and improve feed conversion efficiency.

Biosecurity – thick, stock-proof hedges create barriers to the spread of disease such as bovine TB by reducing animal-to-animal contact between farms.

Parasitic load – livestock self-medicate by browsing on common species found in hedgerows. Some leaves have anti-parasitic properties, rough surfaces that act as a rasping plug or can cause a purging response.

Soil – Soil is the fragile skin that anchors all life on Earth and is one of our most precious resources. The effects of soil erosion go beyond the loss of fertile land. It has led to increased pollution and sedimentation in streams and rivers, clogging waterways and causing declines in fish and other species. Hedgerows reduce soil erosion by reducing surface wind speeds, by acting as a barrier to water run-off and their roots help to stabilise the soil surface. Tree and shrub roots grow deeper than crops so they can access nutrients deeper in the soil profile. This process cycles nutrients into the topsoil. Shelter also creates warmer soils, extending the growing season.



dlr Biodiversity

Hedgerow plant identification sheet

NB: This ID sheet only shows a sample of the more common hedgerow plants. Please refer to an ID book or online for further help

Alder

Gorse

Hazel

Elder

Blackthorn

Hawthorn

Holly

Oak

Rowan

Foxglove

Cow Parsley

Ivy

Dog Rose

Cleavers

Greater Stitchwort

Herb Robert

Bramble

Honeysuckle

Primrose

Red Campion

Wood Anemone

Images courtesy of the 'Hedgerows Grow West' project, see www.biodiversityni.com

Online Resources

https://www.dlrcoco.ie/en/biodiversity/our-hedgerows

https://www.dlrcoco.ie/en/biodiversity

http://www.heritageinschools.ie/content/resources/The%20River%20Nore/The_River_Nore_Lesson_Plan_4_Hedgerows.pdf

https://www.heritagecouncil.ie/content/files/conserving_hedgerows_2mb.pdf

https://hedgelink.org.uk/resources/hedgeucation-learning-and-teaching-resource/

https://www.biodiversityireland.ie/wordpress/wp-content/uploads/Hedgerow_Appraisal_System.pdf

https://www.teagasc.ie/news--events/daily/environment/how-bats-use-hedges.php

https://hedgelink.org.uk/cms/cms_content/files/17_bats_%26_hedges_leaflet.pdf

https://www.schoolearthed.ie/worksheets/Planting-a-native-hedgerow-or-woodland.pdf

https://pollinators.ie/wordpress/wp-content/uploads/2018/04/How-to-guide-Hedgerows-2018-WEB.pdf