UNDERSTANDING ECOSYSTEM SERVICES

5 super-simple lesson plans for primary school teachers to explore ecosystem services in Dún Laoghaire-Rathdown

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Comhairle Contae County Council

Biodiversity Section of Dún Laoghaire Rathdown County Council

www.dlrcoco.ie

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Introduction

Nature – it's amazing! Who doesn't love nature?!

However, nature is in trouble – as you've probably heard.

The citizens you are educating in your classroom today will be entering a very different world than you did when you left school.

They need to be inspired and educated to help them understand and perhaps solve a range of new problems facing the natural world.

They need to be informed and confident of this new language in a more sustainable world.

So lets get Started.....

So, lets get started!

We've all heard of NATURE.

BIODIVERSITY is like a new, 'science-y' word for this. In simple terms "biodiversity" includes all the variety of life on earth. It is the diversity of nature, of our habitats and species such as plants, and animals (including us) and their interconnections with each other. We are a part of nature and everything in nature is connected. Think of all the different species and habitats on our planet as threads in a net, the more threads that intertwine, the stronger the net. The stronger the net, the better biodiversity can provide for us and cope with threats such as climate change.

When these species and habitats come together, we have an ECOSYSTEM.

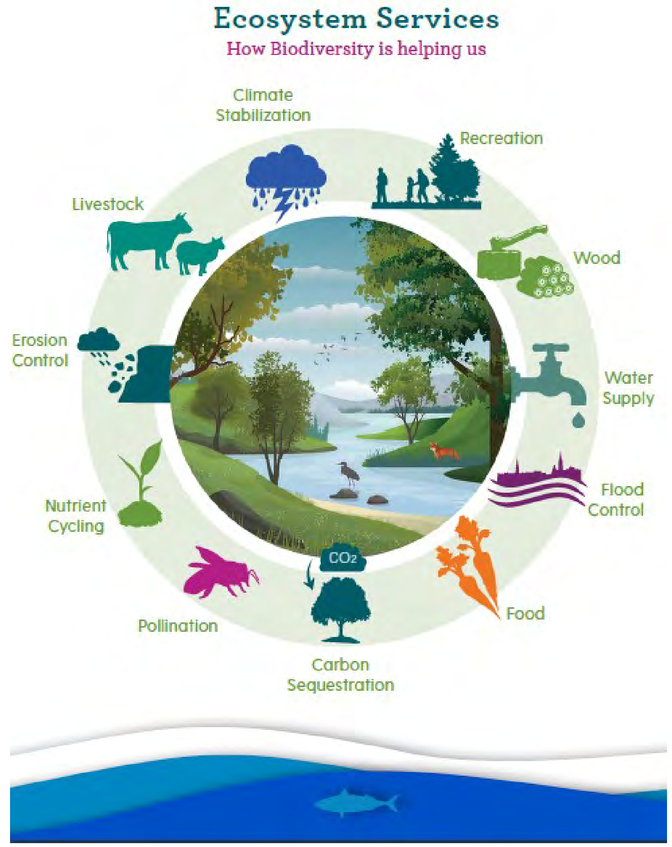
So ecosystems are made of living and non-living things,
e.g.: a fish in a river (Species = fish. Habitat = river).

Biodiversity and our ecosystems provide many services to us such as food, clean air and water, wood, recreation and much more. These are known as ECOSYSTEM SERVICES.

This is the kind of sustainable thinking we need you to instil in our children. Nature isn't there to be plundered. It's there to be loved, valued and nurtured. If not, if we don't look after biodiversity and our ecosystems we'll be left with no ECOSYSTEM SERVICES.

This can be applied to the entire planet, but importantly in our case, on our own doorstep here in Dún Laoghaire-Rathdown.

The **5 LESSON** plans in this booklet have been designed to help you explore the concept of ecosystem services with your class. Each lesson plan begins with some background information and then outlines an interesting project or demonstration to carry out with your students. Each lesson plan also comes with complete teacher short-term planning notes to make the whole process as easy as possible.



Additional information for older classes

ECOSYSTEM SERVICES can be divided in four categories:

Supporting Services

These are the ecosystem services that form the very foundation of life such as the water cycles, photosynthesis, etc.

Provisionary Services

These are the ecosystem services that provide our supplies to survive on a day to day basis such as oxygen, food, etc.

Regulatory Services

As the name implies these are the ecosystem services that regulate natural cycles to keep balance such as pest control or air purification.

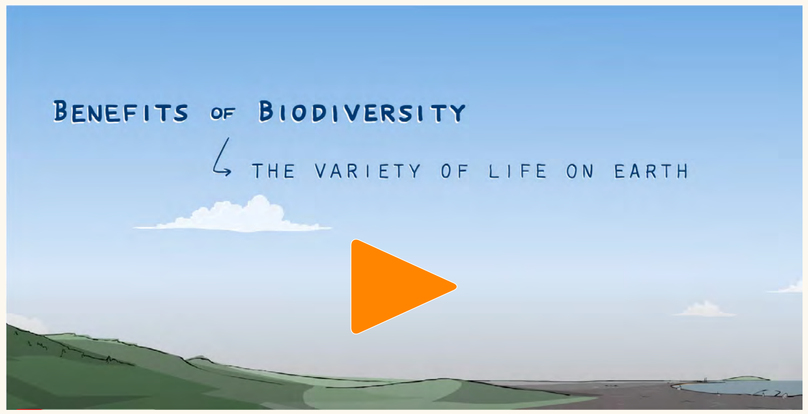
Cultural Services

These are the ecosystem services that appeal to our love of nature and help with our mental and physical wellbeing such as the enjoyment of a walk on the beach or a picnic in the mountains.

‘Benefits of Biodiversity’ Animation

The Biodiversity Officer of Dún Laoghaire-Rathdown County Council created a very attractive animation to introduce both adults and children to the concept of ecosystem services and has created a full webpage explaining the concepts including natural capital which link in with these lesson plans.

You can find the information and view the video on the Dún Laoghaire-Rathdown County Council website here;



https://youtu.be/cAg0TVPsZdM

Lesson Plan 1 Part 1

Biodiversity and Ecosystems, what can they do for me?
Exploring ecosystem services with your class

Introduction

Show your students the four photographs taken from around Dún Laoghaire-Rathdown. Discuss these photographs. Have they ever been there? What can you do there? What connects all these photographs? Biodiversity is the common theme between all the images. Photographs are provided at the end of this Lesson Plan as follows:

Photo 1 Hedgerow along the roadside

Photo 2 Meadow grassland in Shanganagh Park with some species (us !!!)

Photo 3 Stream in Marlay Park

Photo 4 Rocky seashore Dalkey Island with some species (seals)

Ask the students can they think of another word for nature? Biodiversity. What is biodiversity? The variety of life (every living thing) on the planet. Ask the students for some examples of biodiversity. They will list out various species.

Lesson Plan 1 Part 2

Biodiversity and Ecosystems, what can they do for me?
Exploring ecosystem services with your class

We'll play a quick biodiversity game. Ask the class to stand up when the answer is yes or sit down when the answer is no.

Call out questions such as: Are humans part of biodiversity? Yes.
Are squirrels? Yes. Are rocks? No.
Are beetles? Yes. Is water? No. Are fish? Yes. Are wasps? Yes. Is air? No.

Where do these species live? Habitats.

For example Red Squirrel live in Woodland – Where in Dún Laoghaire?
In the woodland in Killiney Hill.

Our natural world is made of living things (such as fish) and non-living things (such as water). All these habitats and species come together to form ecosystems. The services that these ecosystems provide us with are called ecosystem services, such as clean air, clean water, food.

Watch the Dún Laoghaire-Rathdown 'Benefits of Biodiversity' animation with the students at the following link to discover what healthy ecosystems can do for us:

https://youtu.be/cAg0TVPsZdM

Lesson Plan 1 Part 3

Class Activity 1 - Ecosystem Services in OUR community

Answer the following questions on the board with the students:

1) **Where else can you find biodiversity in Dún Laoghaire-Rathdown?**
   Can your students name some habitats or ecosystems?
   (eg: woodland, wetland, natural grassland, river, coastal mudflat)

2) **What species can be found there?**
   (e.g. birds, bats, badgers, hedgehogs, red squirrels, insects).

3) **What can you do there?**
   (eg: enjoy a walk, bird watching, swimming)

4) **What else do we get from these areas?**
   (eg: clean air, clean water, food)

All the services that nature provides are called ecosystem services.

Expand on the answers the students have given with some of the suggested ecosystem services outlined in the following list.
Write these on the board too.

Sample Ecosystem Services:

Wellbeing - Spending time in nature is good for our mental and physical health.

Pollination - Insects do the vital task of pollinating flowers, many of which go on to create the food we eat.

Water purification - Habitats such as wetlands clean our water.

Air Purification - Trees can capture nasty chemicals with their leaves and give us clean air.

Medicines - Many species can be used to unlock amazing medicines to treat illnesses.

Material - Nature provides us with many different materials, from wood to build houses to wool to make clothes.

Food - Not a single day goes by where we don't eat some sort of species, whether it's a fruit or vegetable or a species of animal.

Fuel - We can keep ourselves warm by burning wood.

Photosynthesis - Many species such as plants have the amazing ability to convert the sun's energy into food - like the way a solar panel can create electricity. For example, a tomato plant uses its leaves to capture sunlight and stores this energy in the tomato.

Healthy Soils - Worms and other minibeasts are like secret farmers underneath the ground breaking down old wood and leaves into fresh, fertile soil.

Look back at one of the images of the habitats from Dún Laoghaire-Rathdown, eg: Meadow in Shanganagh Park or Stream in Marlay Park. What ecosystem services does this habitat provide? What happens if it is lost, damaged or polluted? What services are affected? How does it impact our lives if habitats are destroyed? What can we do to prevent this from happening?

Lesson Plan 1 Part 4

Class Activity 2 - Ecosystem Services in MY life

Ask the students to describe a typical school day from the moment they get up. Write some key points of the day on the board, eg: had a shower, ate breakfast, played in the school yard, sat in the classroom, ate dinner, played in the garden/ park. Now begin to connect these activities to the suggested ecosystem services. For instance:

Activity	Ecosystem service
Had a shower	Water cycle to give us water. Water purification for clean water.
Ate breakfast	Photosynthesis for the plants to grow. Soil formation for the plants to survive. Species that we eat. Pollination to help create the food.
Played in the school yard/garden.	Mental wellbeing Physical wellbeing Clean air and oxygen from trees.
Sat in the classroom	Materials to build the school and equipment such as desks, paper and pencils from trees.

The students should be able to list at least 5 ecosystem services that they benefited from today.

Curriculum Links & Integration

Subject	Strand	Strand Unit
Science	Environmental awareness and care	Caring for the environment, Environmental awareness, Science and the environment
Geography	Environmental awareness and care, Natural environments	Environmental awareness, Caring for the environment, The local natural environment
SPHE	Myself and the wider world	Developing citizenship
English	Oral language, Writing	Communicating, Understanding, Exploring and using

Teacher short-term planning notes •• *Lesson Plan 1*

Biodiversity and Ecosystems, what can they do for me?
Exploring ecosystem services with your class

Subject: Geography **Class level:** 3rd and 4th, 5th and 6th
Strand: Environmental awareness and care **Strand Unit (s):** Environmental awareness

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

Third and Fourth Class:

- come to appreciate the need to conserve the Earth's resources
- 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
- identify the interrelationships of living and non-living elements of local and other environments

Fifth and Sixth Class:

- come to appreciate the need to conserve the Earth's resources
- foster an appreciation of the ways in which people use the Earth's resources
- recognise and investigate aspects of human activities which may have positive or adverse effects on environment

Learning Objectives

- Understand, explain and give examples of local Irish nature, biodiversity, species and habitats.
- Explain ecosystems and ecosystem services.
- Recognise and discuss the ecosystem services found in Dún Laoghaire-Rathdown.
- Name and list five ecosystem services that affect their lives.

Learning activities

- *Stimulus:* Show three photographs from Dún Laoghaire-Rathdown. Have they ever been there? What can you do there? What connects all these photographs?

Talk and discussion: Focus on meaning and understanding of the words nature, biodiversity, species, habitats, ecosystem and ecosystem services (see booklet). Complete biodiversity game.

Watch Dún Laoghaire-Rathdown *'Benefits of Biodiversity'* animation.

Complete Class Activity 1 - Ecosystem Services in OUR community: Write answers on board. Expand on answers with additional benefits of ecosystem services.

Questioning: Show one of the stimulus photographs again. What ecosystem services does this habitat provide? What happens if it's cut down? What services are affected? How does it impact our lives if habitats are destroyed? What can we do to prevent this from happening?

Complete Class Activity 2 - Ecosystem services in MY life.

List 5 ecosystem services that the students benefited from today.

Differentiation

- *Stimulus:* Different levels of questioning can be used accordingly. Varying levels of teacher support. Teacher pace.

Linkage and integration

Geography - Natural environments (The local natural environment), Environmental awareness and care (Caring for the environment)

Science – Environmental awareness and care (Environmental awareness, Science and the environment, Caring for the environment)

SPHE – Myself and the wider world (Developing citizenship)

English – Oral language, writing (recording)

Assessment

Self-assessment ◗ Conferencing ◗ Concept mapping ◗ Questioning

Teacher observation ◗ Teacher-designed tasks and tests

Resources

Dún Laoghaire-Rathdown County Council booklet Lesson Plan 1 - *Nature. So what? Exploring ecosystem services with your class*

Photographs of three locations in Dún Laoghaire-Rathdown (in booklet)

Dún Laoghaire-Rathdown 'Benefits of Biodiversity' animation: *https://www.dlrcoco.ie/en/heritage/biodiversity/natural-capital-and-ecosystem-services*

Whiteboard, whiteboard markers

Lesson Plan 2 Part 1

How to catch a raindrop - How biodiversity prevents flooding.

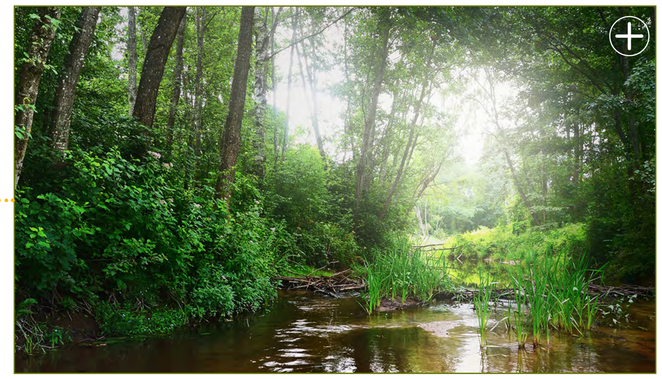
Introduction

Floods are a common type of natural disaster and occur when water covers land that is usually dry. Floods in Ireland are often caused by heavy rain running off the land because it cannot soak the rain up quick enough. This is usually because the land has been changed by man and has lost its soaking ability. The rainwater flows off the land into the nearest river which can make river waters rise and burst their banks. This can result in damage to houses and shops and even loss of life. Nature provides a very important ecosystem service to prevent flooding by catching and holding rainfall (eg: a woodland or reedbed along the edge of the river will hold water, preventing a rush of water into the river which could have caused flooding).

Our natural habitats in our county of Dún Laoghaire-Rathdown are very important for helping to prevent flooding. However, if we lose or damage our natural habitats, they can no longer act as sponges and water enters the rivers too quickly, causing flooding. Therefore, it is essential we look after our natural habitats along rivers and fully appreciate the ecosystem services they provide.

Classroom Demonstration

In this classroom demonstration we will show how our habitats along our rivers and streams in Dún Laoghaire-Rathdown help prevent flooding. The banks of our rivers and streams are important in the prevention of flooding as often they capture or slow the release of water into the river itself. Ask the students can they name any local rivers. Have they ever witnessed local flooding? How did it affect them or the people who lived nearby? We will build a model of a river bank using classroom clay and a number of everyday items to represent various habitats.



Lesson Plan 2 Part 2

Materials

Large, flat tray such as an aluminium baking tray, classroom air-drying clay, kitchen roll, two facecloths, pieces of sponge, toothpicks/ matchsticks, paper, pencils, two measuring jugs, water.

Instructions:

1. Use the clay to build a sloping riverbank in the tray. Keep some of the bottom of the tray exposed with no clay (this is the river).

2. Make a small hole in the 'river' part of the aluminium tray (about 1cm) to allow water to flow out of the model. Raise the model off the table by propping it on top of some books and place a measuring jug underneath this hole.

3. Take another measuring jug and fill it with a specific volume of water (e.g. 500ml) and pour this along the top of the riverbank. Observe the water running down the riverbank and into the river. Check the volume of water in the second measuring jug. How much water flowed through the model? Was any water lost? Why? This simulates a bare, concrete riverbank with no habitats. Reuse the water by pouring it back into the first measuring jug.

4. Next, simulate a grassy riverbank by laying down sheets of kitchen roll on the riverbank. You may need to hold the materials in place using toothpicks/ matchsticks. Repeat the process above of pouring a specific volume of water through the system. Check the second measuring jug to see how much water flowed through the model. Was there any difference between the volume poured onto the riverbank and that recorded in the river (second jug)? Why? Record your answers. Empty the second measuring jug.

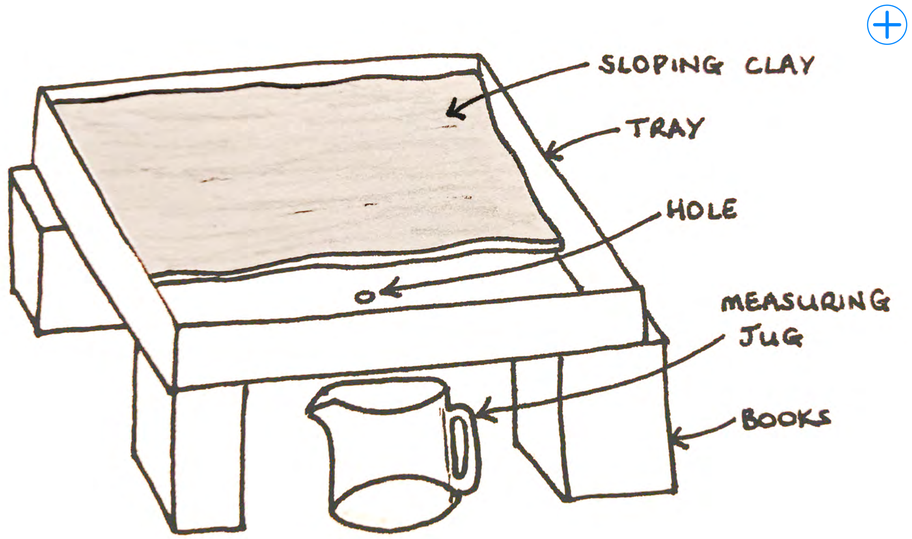
5. Repeat step 4 above but replace the wet kitchen paper with dry kitchen paper. Also, add a facecloth to simulate a reed bed habitat. Repeat the process above of pouring and collecting a specific volume of water through the system. How much water flowed through the model? Is there any difference in volume? Why?

6. Finally, repeat step 4 above replacing the used kitchen paper and facecloth. This time pin pieces of sponge along the riverbank, to represent tree roots, using toothpicks/ matchsticks and repeat the process above of pouring and collecting a specific volume of water through the system. How much water flowed through the model? Is there any difference in volume? Why?

7. Look at the volumes you recorded. What type of riverbank was the worst at retaining water and causing flooding? What type of riverbank was the best at retaining water and preventing flooding? Ask the students what would happen if we removed nature from all the riverbanks in Dún Laoghaire-Rathdown? If they lived in a house beside a riverbank what would they like it to look like? Can the students design their own riverbank?

Curriculum Links & Integration

Subject	Strand	Strand Unit
Geography	Natural environments	Lands, rivers and seas of my county, The local natural environment
Science	Materials, Environmental awareness and care	Materials and change, Caring for the environment, Environmental awareness
SPHE	Myself and the wider world	Developing citizenship
Math	Measures	Capacity



Extension: This lesson could lead to further studies and projects of the rivers in the Dún Laoghaire-Rathdown area.

Teacher short-term planning notes •• *Lesson Plan 2*

Biodiversity and Ecosystems, what can they do for me?
Exploring ecosystem services with your class

Subject: Geography **Class level:** 3rd and 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 the ways in which these features have been used by humans and the changes which have occurred as a result
- investigate and become familiar with some natural features in the local environment

Fifth and Sixth Class:

- become aware of the ways in which people, animals and plants have exploited and/or altered these features
- investigate the influence of these features on plants and on the lives of animals and people
- observe and develop simple understanding of the links between these features
- investigate and learn about the main natural features in the locality and county

Learning Objectives

- Understand and be able to state what flooding is, what causes it and how we can help nature to prevent flooding.
- Name some local rivers.
- Recognise the important role that riverbanks have in preventing flooding.
- Name which features of riverbanks are the best and worst at preventing flooding (concrete, grass, reedbed, trees). Recognise and understand the role humans have played in altering the riverbanks (positive or adverse).
- Understand that nature plays a vital role in preventing flooding and how they can help nature.

Learning activities

- *Stimulus:* Hold up the sponge. What sort of habitat a sponge could represent?

Talk and discussion about flooding: Have they experienced any flooding? Have they seen it in the news? What do they think causes flooding? Name some local rivers.

Complete classroom demonstration to show how the banks of rivers and streams are very important in preventing flooding.

Talk and discussion about which riverbank was the best or worst for flooding.

Questioning: What would happen if we removed nature from all the riverbanks in Dún Laoghaire-Rathdown? If they lived in a house beside a riverbank what would they like it to look like?

Complete design activity: Can the students design their own riverbank?
Present to the class.

Extension activities: Studies or projects on rivers in the Dún Laoghaire-Rathdown area.

Differentiation

Different levels of questioning can be used accordingly.
Varying levels of teacher support. Teacher pace.

Linkage and integration

Geography - Natural environments (Lands, rivers and seas of my county)

Science – Materials (Materials and change), Environmental awareness and care (Environmental awareness, Caring for the environment)

SPHE – Myself and the wider world (Developing citizenship)

Maths – Measures (Capacity)

English – Oral language, writing (recording)

Assessment

Self-assessment ◗ Conferencing ◗ Concept mapping ◗ Questioning

Teacher observation ◗ Teacher-designed tasks and tests

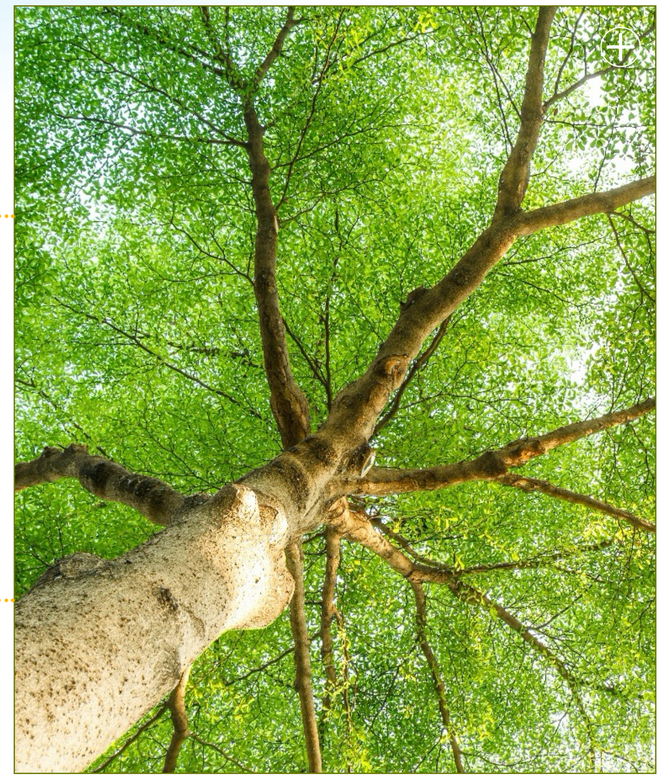
Resources

Dún Laoghaire-Rathdown County Council booklet - *Nature. So what?*
Lesson Plan 2 - How to catch a raindrop - How nature prevents flooding

Large, flat container/ tray such as a baking tray, classroom air-drying clay, facecloth x2, kitchen roll, pieces of sponge, toothpicks/ matchsticks, paper, pencils, measuring jugs x2, water, stopwatch.

Lesson Plan 3 Part 1

Choosing your crann cara - How trees help us breathe.



Introduction

Trees are a magnificent part of our biodiversity and we are very lucky here in Dún Laoghaire-Rathdown to have some beautiful examples from mature urban trees lining our streets to native woodlands such as Loughlinstown Woods and Fitzsimons Woods. However, trees are often overlooked and easily moved aside in favour of other developments or even because people don't like them close to their driveway or house.

Trees provide a huge range of ecosystem services including the removal of pollutants from our air in urban areas, providing habitats for a range of other species such as birds and bugs and of course providing the very oxygen that we breathe! In fact, we each individually need 7.5 trees to create enough oxygen to breath for a year. How many trees are needed for your classroom? How many trees are needed for your school? What about the whole of Ireland? What about the entire planet?! To help children better appreciate our trees we will adopt an Irish tree. By adopting a class tree, or crann cara, students become more connected to their local environment, place and community.

Classroom Project - Crann cara

This classroom project involves choosing a local Irish tree as your classroom's crann cara and creating a simple booklet to help record and explore the tree as it moves through the seasons. By doing this the students will also learn about the ecosystem services our trees and woodlands provide.

Ask the children to name somewhere they could find trees. They are most likely to say the rainforest or jungle. Tell them to think about Irish trees and they might name a woodland or maybe their local park in Dún Laoghaire-Rathdown. Of course these are very important but did they know that there is often a hidden woodland in their gardens and streets. If you have a garden how many trees are growing in it? As you came to school today how many trees do you think you passed? Do you know how many trees are on the school grounds? If you live in a town or city the trees that are planted on roundabouts or beside pavements are called urban trees. These trees are really important as they also provide oxygen, habitats for animals and clean our air.

Choose a tree that is easy to access, either on the school grounds or nearby. Identify what species it is before choosing it with the students. Make sure to give your tree a name! The easiest way to identify a tree is by looking at its leaves. Try to choose something familiar such as a horse chestnut, oak, beech, lime, sycamore, ash, etc. Trees planted on school grounds are often ornamental or non-native making them difficult to identify correctly. These trees also act as a poor reference point for the students as they may not encounter the same species of tree again.

Of course use these trees if there is no other option! The students will still be able to do all of the activities and will still learn a great deal.

In addition it would be ideal if the students are able to see their tree during their normal day-to-day activities. They are more likely to notice changes themselves throughout the year and it will instil a greater sense of ownership.

Lesson Plan 3 Part 2

Materials

Crayons, measuring tape, clipboards or hardback notebooks, blank A4 paper, pencil, large cotton sheet or similar, stapler, colouring pencils.

Instructions

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

Keeping all the tree 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 tree 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.

A) Bark Rubbing

1) Place the paper directly onto a dry part of the tree trunk.
2) Rub a crayon over the paper. Using the side of a chunky crayon gives the best results.
3) Observe the pattern of the bark. Is it rough or smooth? Is there a pattern?

B) Leaf Rubbing & Printing

1) Pick a leaf off the tree or in autumn pick one from the ground. Try to pick a leaf that really represents your 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.

C) Tree Height

1) The children will have lots of ideas of how to measure the height of a tree; from chopping it down to climbing the tree with a measuring tape! However in this activity we will use a crude version of a mathematical model based on the geometry of a triangle.
2) Stand at the base of the tree with your back to trunk.
3) Take a number of large steps forward.
4) Bend forward and look through your legs. You have to be reasonably bendy! Can you see the top of the tree through your legs?
5) If not, keep walking forward and looking back through your legs.
6) As soon as you can see the top of the tree through your legs you can turn around and pace out how many steps back to your starting point.
7) Multiply this number of steps by the length of your stride and this is the rough estimate of your tree height.

D) Tree Age

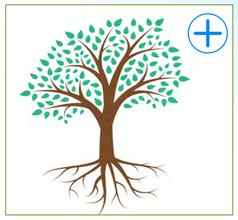
1) Ask the students how they could find out the age of the tree. Of course it is very rude to ask a tree its age directly! Most will say to chop it down and count the rings which would of course kill the tree! They could also suggest taking a sample of the tree trunk using a borer. This borer takes a cross section of the tree trunk and once pulled out the rings can be counted. This does damage the tree and most people do not have a borer lying around! There is another way to do it without chopping the tree down and just using some simple maths.
2) Wrap the measuring tape around the tree trunk one metre from the ground. Note down this measurement. This is the circumference or girth of the tree.
3) Most trees grow at a rate of 2.5cm per year. So if the girth of the tree is 25cm then it is approximately 10 years old (25cm divided by 2.5cm).

Extension: Some trees grow at faster or slower rates. Oak and beech trees grow at a slower rate (1.88cm per year) and pine trees grow faster (3.13cm per year). What age would your tree be if it was an oak, beech or pine? Do you think other things affect how fast the tree grows? Yes. If the tree is close to other trees it cannot grow as fast. Urban trees usually have plenty of space and so can grow faster.

E) Tree Sketch

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 tree accurately and communicates clearly through the use of labels.

Lesson Plan 3 Part 3



Outline sketch of the tree

1) Pick a spot far away from the tree ideally somewhere that the students can sit down.
2) Discuss the tree. How thick is the trunk compared to the branches? What way do the branches hang? Do they grow upwards or droop downwards? Where are most of the leaves found? For example are they at the top of the tree or near the end of the branches? Does the tree stand straight and tall or is it leaning in a particular direction? Can you spot any ivy or lichens growing on the trunk or branches? Is the ivy or lichen affected by the wind and sunshine?
3) Now draw the tree. Label what you can see. It is best to imagine that you are drawing this tree for someone who has never seen it before.

Bud/ Tree/ Flower/ Seed Sketch

As you visit your tree 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 tree in autumn. Are there seeds on the tree such as horse chestnuts, beech nuts or acorns? Have a very close look at them. Perhaps you can find some on the ground. Sketch them.
2) Visit your tree in winter. The leaves will have most likely fallen off. 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 tree in spring. The buds should have burst and the leaves unrolled. What shape are the leaves? How do they feel? Sketch them.
4) Visit your tree in summer. Have flowers emerged on the tree? What colour are they? What shape are they? Does anything visit the flower during your observation? Explore them closely and sketch them.

F) Tree minibeasts

Trees are home to many different species such as lichens, birds, squirrels and minibeasts. Try to find and identify some of the minibeasts on the tree. Even if you cannot name them this is a good exercise in demonstrating how many species use your tree. 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.

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 without causing any damage. Watch how many minibeasts fall onto the sheet.

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) 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.

Curriculum Links & Integration

Subject	Strand	Strand Unit
Science	Living things, Environmental awareness and care	Plant and animal life, Environmental awareness, Caring for the environment
Geography	Environmental awareness and care	Environmental awareness, Caring for the environment
SPHE	Myself and the wider world	Environmental care
Math	Measures, Shape and space	Length, Lines and angles
Visual Arts	Drawing, Prints	Making drawings, Making prints

Teacher short-term planning notes •• *Lesson Plan 3*

Choosing your crann cara - How trees help us breathe

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
- use simple keys to identify common species of plants and animals
- discuss simple food chains
- become aware of some of the basic life processes in animals
- investigate the factors that affect plant growth

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
- construct and use simple keys to identify locally occurring species of plants and animals
- become aware of some of the basic life processes in animals and plants
- investigate the factors that affect plant growth

Learning Objectives *Choose the learning objectives that match the activities chosen.*

- Recognise, appreciate and understand how important trees are - that they provide us with the oxygen that we breathe and that they purify the air.
- State the number of trees required to provide one person with oxygen for an entire year.
- Understand that urban trees complete a very important role. Identify where they can find these trees.
- Identify and name their crann cara.
- Observe their tree throughout the seasons.
- Identify and recognise their trees' leaves, bark, buds, flowers, seeds and silhouette.
- Understand that their tree changes and adapts throughout the seasons.
- Find and record the height and age of their tree using simple mathematical methods. Understand how a tree grows.
- Recognise the importance of a tree as a habitat to many other animals, specifically minibeasts. Identify minibeasts.
- Understand that humans can impact the tree and the animals that depend on it.

Learning activities

Stimulus: Ask class to take in a deep breath. Ask what they breathed in and out? Where does the clean air we breathe come from? How many trees does each person need to breathe for one year? How many needed for the entire class?

Questioning: Where can you find trees? Where could they find trees closer to home? Name some local Irish trees. Discuss urban trees.

Create a 'tree booklet' by stapling A4 paper together. Discuss and choose the class crann cara. Identify and name the tree.

Complete some or all of the following activities: Bark rubbing • Leaf rubbing and printing • Tree height • Tree age • Tree sketch • Tree minibeasts

Record in the tree booklet. Talk and discussion based on findings.

Differentiation

Different activities can be chosen to suit the class abilities. Different levels of questioning can be used accordingly. Varying levels of teacher support. Teacher pace.
Mixed or similar ability groups.

Linkage and integration

Science - Environmental awareness and care (Environmental awareness, Caring for the environment)

Geography – Environmental awareness and care (Environmental awareness, Caring for the environment)

SPHE – Myself and the wider world (Developing citizenship)

Maths – Measures (Length), Shape and space (Lines and angles)

Visual Arts – Drawing (Making drawings), Prints (Making prints)

English – Oral language, writing (recording)

Assessment

Self-assessment ◗ Conferencing ◗ Concept mapping ◗ Questioning

Teacher observation ◗ Teacher-designed tasks and tests

Resources

Dún Laoghaire-Rathdown County Council booklet - *Lesson Plan 3 - Choosing your crann cara - How trees help us breathe.*

Crayons, measuring tape, clipboards or hardback notebooks, blank A4 paper, pencil, large cotton sheet or similar, stapler, colouring pencils.

Lesson Plan 4 Part 1

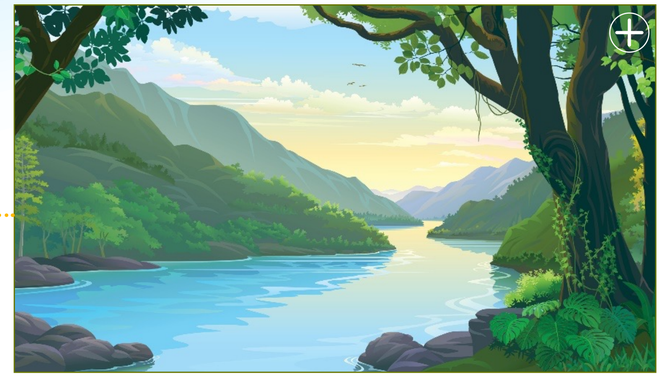
Water, water everywhere and not a drop to drink - How nature cleans our water

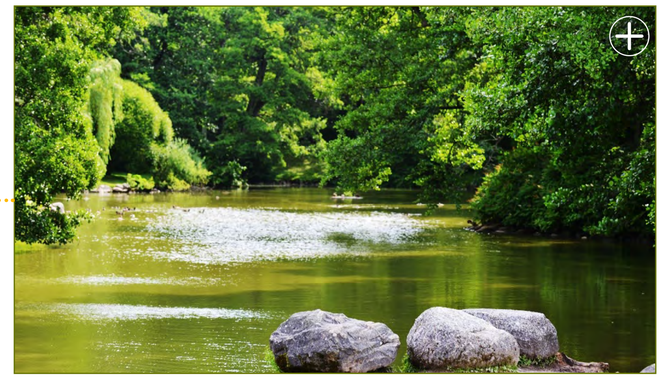
Introduction

When we look at the earth from space it's clear much of the planet is covered in water. In fact, 70% of the earth's surface is water. However, most of this is salt water – which is pretty useless for us humans to drink. What we need is freshwater, not saltwater. You might be surprised to know that of all the water on our planet only 2.5% is freshwater. Even then, 99% of this is locked away in snow and ice leaving a grand total of 0.007% of water for us to use. That's a teeny, tiny amount! Therefore, we need to be extremely careful to take care of this water.

This concept can be demonstrated to the class using a measuring jug to represent the earth's water. Firstly, fill the jug to the maximum (eg: 1 litre). Then pour out most of the water leaving just 2.5ml to represent freshwater. Then pour out the rest, explaining that the remaining droplets on the side represent the drinking water available to us. Collect the water that has been poured out in a matching measuring jug. Don't waste the water - use it at the sink or water your plants!

We have special wastewater treatment plants where we send our dirty water to be cleaned and other treatment plants where we create drinking water. However, this is expensive. Thankfully, nature has the ability to create clear, healthy water for us completely free of charge through its ecosystem services. Nature does this through wetland habitats. Ireland is particularly lucky to have many wetlands such as lakes, rivers, bogs, marches, ponds, fens, estuaries and lagoons. These areas are fantastic at filtering and cleaning our water by passing the water through various living and non-living parts of the habitats such as mosses and sediments.





Wetland - River with trees and vegetation that act as water filters

Lesson Plan 4 Part 2

Class Activity – Build a Water Filter

What we will do in class today is create a model of a wetland that demonstrates how nature can act as a filter to clean our water. We will use various household items to represent the different components of a wetland. We will pour a dirty water sample in at the top of the filter and collect the 'cleaned' water at the bottom.

Before beginning this lesson add a small amount of cocoa powder to a glass of water or a clear drinking bottle. It makes the water appear dirty. If possible leave hidden in the class sink.

When ready to begin the lesson say you are feeling thirsty. Go to the sink, turn on the tap and pretend to fill a glass with water. Swap the clean glass for the 'dirty water' glass from earlier.

Turn around, act surprised and show the students the glass of dirty water. Shrug your shoulders and drink the water anyway. Ask the students what was wrong with what you did – dirty water could make you sick, there must be something wrong with the water supply etc. Explain to the students that you didn't in fact drink dirty water! This opens a discussion on where water comes from and how we can take clean drinking water for granted.

Emphasise that ecosystem services can provide us with clean water and how interfering with these services can mean dirty water or spending a lot of time and money undoing the damage.

Note: This water filter does not clean dirty water to a drinkable standard. It may contain bacteria. **Please do <u>not</u> allow** the students to drink the filtered water.

Materials

Each group will need A4 paper, pencil, 2 litre clear water bottle, scissors, tap water, container for tap water, clay or dirt, measuring jug, elastic band. Possible materials for making the filter: cotton wool, kitchen roll, coffee filter, gravel, pebbles, sand, barley/rice, dishwashing cloth, sponge.

Note: The materials required to make the filters may already be available (provided by the teacher) so the students can start making their filter straight away or the students can decide what materials they want to use; they must bring them in to school themselves on the day they are to make the filter. Ideally each group will use the same size of plastic bottle to ensure fairness between groups. A clear bottle is better as the students can see the water moving through the filter.

Instructions:

1) 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) Graphic designer - draws the design and ensures everyone in the group understands the reasons behind each decision made

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

2) Each group will design and draw a labelled diagram of their filter. They must write down why they have chosen the various materials.

3) Each group will make their filter within an allocated amount of time. They can modify their design if necessary but must be able to explain their reasons later.

4) Each group must present their design and filter to the class. They must explain why they chose their materials, the order of the materials in the filter, any modifications made (their design versus the filter they made), anything they would change now they have made it. The class will discuss which filter they think will work best once they have seen everyone's presentation.

5) A dirty water sample will be made for the entire class by adding a scoop of soil or dirt to tap water. Each group will be given a specific measurement of this dirty water for use in their filter, eg. 250ml.

6) The fun part! The filters will be tested by running the sample of dirty water through. Which filter gave the cleanest sample? Compare to the original sample of dirty water. Measure how much water came through the filter – was much water 'lost' in the filter (eg. cotton wool may absorb and store a lot of water). Discuss how important it is that we have clean drinking water and how much time and effort nature saves us by cleaning it for us. Remember the layers used in the filter represent ecosystems such as wetlands containing various sediments and species.

Curriculum Links & Integration

Subject	Strand	Strand Unit
Science	Materials, Environmental awareness and care	Materials and change, Science and the environment
Geography	Environmental awareness and care	Environmental awareness
SPHE	Myself and the wider world	Developing citizenship
Math	Measures	Capacity
English	Oral language, Writing	Communicating, Understanding, Exploring and using

Teacher short-term planning notes •• *Lesson Plan 4*

Water, water everywhere and not a drop to drink - how nature cleans our water.

Subject: Science **Class level:** 3rd and 4th, 5th and 6th
Strand: Materials **Strand Unit:** Environmental awareness and care

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

Third and Fourth Class:

- explore some simple ways in which materials may be separated
- recognise and investigate human activities which have positive or adverse effects on local and wider environments

Fifth and Sixth Class:

- explore some simple ways in which materials may be separated
- recognise and investigate aspects of human activities that may have positive or adverse effects on environments

Learning Objectives

- Understand that some water needs to be filtered before it is of a drinkable standard.
- Acknowledge and understand that human activities can have a negative effect on the earth's natural filtering systems.
- Name ways in which humans can affect nature's water filtering systems.
- Understand and be able to explain how a water filter works.
- Work as part of a group to design and make a water filter.
- Recognise how important wetlands and other ecosystems are in our everyday lives.

Learning activities

Stimulus: Teacher drinking 'dirty' water from the class tap or bottle.

Talk and discussion based on why it is important that water is clean and of a drinkable standard.

Demonstration of how much of the earth's freshwater is available for use (0.007%)

Assign groups and individual roles.

Design water filters.

Make water filters using materials provided by teacher OR individual groups collect materials and make filter.

Presentation of group design and filter to the class. Talk and discussion based on modifications and materials used.

Test the filters using a set amount of water.

Talk and discussion based on how important it is to have clean drinking water and how much time and effort nature saves us by cleaning it for us. Connect learning back to ecosystems and examples of natural filters such as wetlands.

Differentiation

Different levels of questioning can be used accordingly.

Varying levels of teacher support.

Materials provided by teacher or collected by students.

Mixed or similar ability groups.

Individual roles assigned to particular individuals depending on ability.

Linkage and integration

Science - Environmental awareness and care (Environmental awareness and care, Caring for the environment)

Geography – Environmental awareness and care (Environmental awareness, Caring for the environment)

SPHE – Myself and the wider world (Developing citizenship)

Maths – Measures (Capacity)

Visual Arts – Drawing (Making drawings)

English – Oral language, writing (recording)

Assessment

Self-assessment ◗ Conferencing ◗ Concept mapping ◗ Questioning

Teacher observation ◗ Teacher-designed tasks and tests

Resources

Dún Laoghaire-Rathdown County Council booklet - *Lesson Plan 4 – Water, water everywhere and not a drop to drink - How nature cleans our water*

Glass or bottle, Cocoa powder, Drinkable water

For each group:

A4 paper, pencil, 2 litre clear water bottle, scissors, tap water, container for tap water, clay or dirt, measuring jug, elastic band.

Possible materials for making the filter: cotton wool, kitchen roll, coffee filter, gravel, pebbles, sand, barley/rice, dishwashing cloth, sponge.

Lesson Plan 5 **Part 1**

Investigating the bee's knees - How pollinators create our food

Introduction

How do plants grow? Plants have leaves for photosynthesis. Photosynthesis is the way in which plants get energy from the sun, in the same way humans eat food for energy. This allows them to grow.

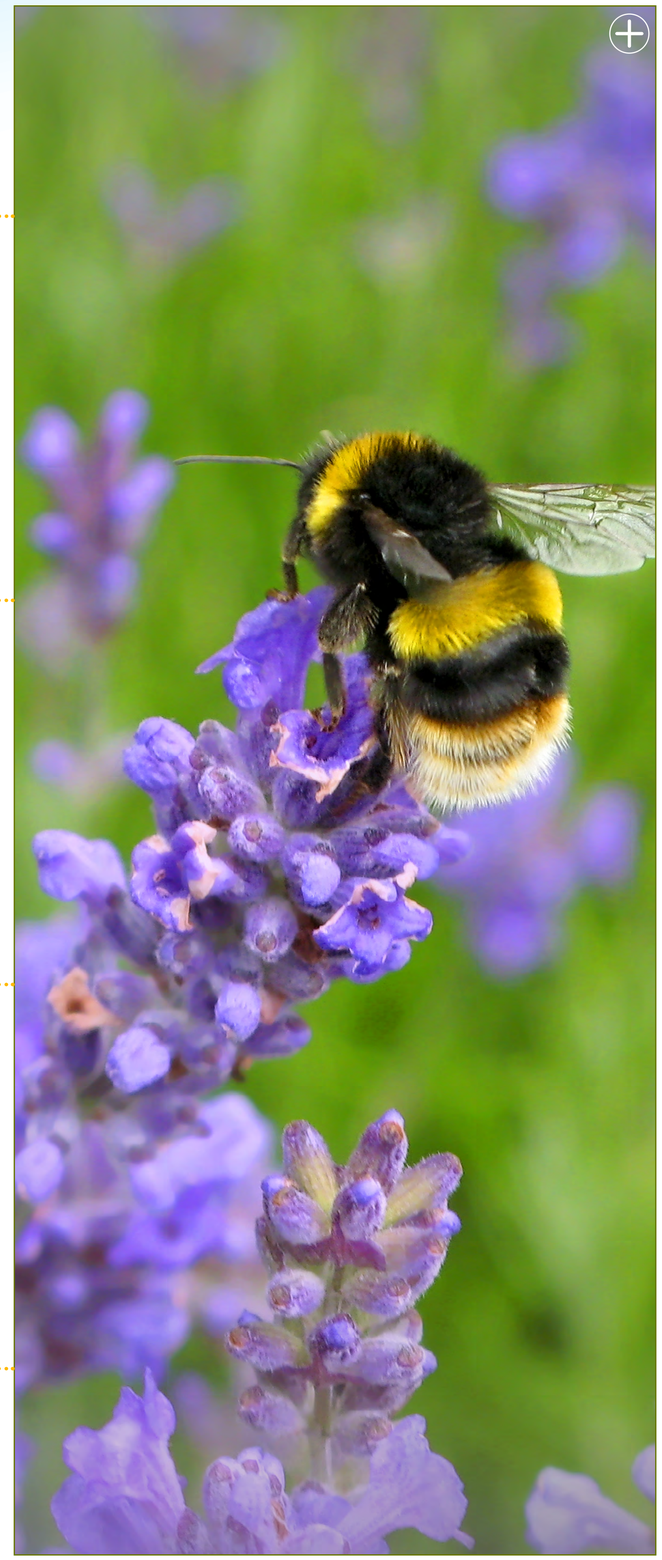
Why do plants produce flowers? Many do this to attract pollinators. Plants cannot move and therefore cannot find another plant to reproduce with. They need to swap small grains called pollen and so they need something to move the pollen for them.

Who could do this for them? Animals!

How do they get the animal to do this? They produce flowers that usually contain a yummy liquid called nectar. Animals such as bees see the beautiful flower and learn that there is nectar inside – delicious! However the plant hides the nectar deep down in the flower so the animals have to wiggle around. This wiggling causes the powdery pollen to fall from the plant onto the animal. The animal then goes to another flower and some of this pollen falls off into the other flower. Perfect! The plant was able to use the animal to send its pollen to another plant. It also receives pollen from animals that have been in other flowers. This only works if the pollen is from the same species of flower. A daisy cannot pollinate a dandelion!

Once the plant has received the pollen it no longer needs the flower. The flower withers away and a seed is now formed. This seed will grow into another plant and so the plant has successfully reproduced! This process benefits us humans as these seeds are often packaged inside tasty fruits and vegetables, eg: apple seeds inside the core of an apple. Bees alone are responsible for pollinating 71 of the top 100 foods in the world. This accounts for 90% of the world's food supply!

What are the most important pollinators in Ireland? Bees, butterflies, hoverflies and moths.



Lesson Plan 5 Part 2

Class Activity 1 - Pollination Race

This game helps the children explore how pollination works. You will need cheesy puff crisps or another “messy” type of crisp, bowls x 9.

1) Place 15 cheesy puffs into each bowl x 5
2) Spread the bowls out around the room or outdoors.
3) Divide the class into 4 groups. Team names are bees, butterflies, moths and hoverflies.
4) Provide each group with an empty bowl.
5) Explain that each bowl represents a flower. The cheesy puffs represent the nectar and the powder on the outside of the puffs represents the pollen. The children are the pollinators.
6) Each group needs to collect as many cheesy puffs as they can. To do this they need to run to a bowl and collect a cheesy puff, one at a time. They must return to their group and place the cheesy puff into the bowl. The next student can go as soon as the cheesy puff is placed in the bowl. It’s a bit like a relay. Nobody can lick or clean their fingers until the very end!
7) The students think the idea is to collect as many cheesy puffs as possible - and indeed the winners will be the ones with the most cheesy puffs, however the real point is to show how the pollen sticks to their fingers as they try and collect the food. They didn’t care that they had powder on their hands as long as they got the food – just like pollinators.

Lesson Plan 5 Part 3

Class Activity 2 - Lunchbox Challenge

We can thank pollinators for one in every three mouthfuls of food. Therefore, if we remove pollinators, we will lose much of our food. Get the students to open up their lunchboxes. Get them to list out every single individual item. If this is not possible, get them to list what they have already eaten today.

Can the students figure out what was pollinated in their lunchbox? Every pollinated item needs to be taken out and put on the lid of their lunchbox. Remember some foods come from other countries and these may be pollinated by other animals such as bats and birds. These animals do not pollinate crops grown in Ireland but are still very important.

Pollinated foods from around the world include apples, avocado, banana, blueberry, cherry, coconut, chocolate, coffee, coconut, grapes, kiwi, melon, mango, peach, pear, raspberry, blackberry, strawberry, tea, vanilla and tomato.

Most grasses, such as wheat, are either self-pollinated or are wind pollinated. So most breads do not need animals to pollinate them. They are safe in your lunchbox! Dairy foods are also pollinator-free. Is one third of your lunch gone? Or more?

Lesson Plan 5 Part 4

Class Activity 3 - Wildflower Survey

One of the easiest and best ways to help our pollinators is to grow wildflowers. However, we don't have to buy seed for this. We often have the most amazing wildflowers hidden in our grass at school. All we have to do is let the grass grow a little longer than normal to let them bloom.

During the spring and summer arrange for the children to ask the caretaker to mark out a sunny area of the school grounds where the grass won't be cut for at least 6 weeks. This could be an area as small as a classroom desk.

Over the course of a few weeks visit this wildflower patch and compare it to the rest of the grass. Are there any differences? Are there any wildflowers? How many? What colour? What type? Construct or use simple keys to identify the wildflowers. Would you see the same plants growing here in spring, summer or autumn? Could you record these through drawings or pictures? Do any pollinators visit the patch while you are observing? Estimations of the number of different plants growing there could also be made and plotted into graphs. Perhaps

Curriculum Links & Integration

Subject	Strand	Strand Unit
Science	Living things	Plant and animal life
Geography	Natural environments, Environmental awareness and care	The local natural environment, Environmental awareness, Caring for the environment
SPHE	Myself and the wider world	Developing citizenship
Math	Data	Representing and interesting data
Visual Arts	Drawing	Making drawings
English	Oral language, Writing	Communicating, Understanding, Exploring and using

Teacher short-term planning notes •• *Lesson Plan 5*

Investigating the bees' knees - How pollinators create our food.

Subject: Science **Class level:** 3rd and 4th, 5th and 6th
Strand: Living things **Strand Unit:** Plant and animal life

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

Third and Fourth Class:

- become aware of some of the basic life processes in animals
- use simple keys to identify common species of plants and animals
- observe, identify and investigate the animals and plants that live in local environments
- become aware of some of the basic life processes in animals
- understand that plants use light energy from the sun
- come to appreciate that animals depend on plants and indirectly on the sun for food

Fifth and Sixth Class:

- understand some ways in which plants reproduce
- become aware of some of the basic life processes in animals and plants
- construct and use simple keys to identify locally occurring species of plants and animals
- become aware of the sun as a source of energy for plants through photosynthesis
- identify the interrelationships and interdependence between plants and animals in local and other habitats
- observe, identify and examine the animals and plants that live in local habitats and environments

Learning Objectives

- Understand how plants get energy from the sun through photosynthesis.
- Recognise and understand that some plants need help from the wind or animals in order to produce seeds (reproduce).
- Name the animals that help plants reproduce in Ireland (bees, hoverflies, butterflies and moths).
- Understand how pollination works and how it benefits both the plant and animal through participation in a Pollination Race.
- Understand how this process affects humans through the food we eat through participation in a Lunchbox Challenge game.
- Name some foods pollinated by animals.
- Conduct a wildflower survey and be able to identify some Irish wildflowers.

Learning activities

Stimulus: Stimulus: Two potted plants (or an image of two plants).

Talk and discussion based on how plants grow, produce flowers and reproduce when they cannot move.

Discussion of photosynthesis, pollination and ways in which the plants use animals to help them.

Pollination Race to demonstrate how Irish pollinators collect nectar and move pollen for the plants.

Lunchbox Challenge to demonstrate how the students' lunch is directly affected by pollination. Name the foods pollinated by pollinators.

Differentiation

The wildflower survey can be simplified to identify two or three plants or can be made more challenging with a higher number of plants.

Different levels of questioning can be used accordingly.

Pair and groupwork may be used as necessary.

Linkage and integration

Geography – Natural environments (The local natural environment), Environmental awareness and care (Environmental awareness, Caring for the environment)

SPHE – Myself and the wider world (Developing citizenship)

Maths – Data (Representing and interpreting data)

Visual Arts – Drawing (Making drawings)

English – Oral language, writing (recording)

Assessment

Self-assessment ◗ Conferencing ◗ Concept mapping ◗ Questioning

Teacher observation ◗ Teacher-designed tasks and tests

Resources

Dún Laoghaire-Rathdown County Council booklet - *Plan 5 – Investigating the bee's knees - How pollinators create our food*

For each group:

Potted plants x2 (or images of plants)

Cheesy puffs or another "messy" type of crisp (approximately 75 cheesy puffs needed)

Bowls x9

Irish wildflower identification sheet or simple key

SESE copy or hardback

Pencils

Further information

Biodiversity section of Dún Laoghaire-Rathdown County Council website:

www.dlrcoco.ie/en/heritage/biodiversity

National Biodiversity Data Centre

www.biodiversityireland.ie

References

WWF (2013) Nature's Services: a guide for primary school on ecosystem services.

Ecosystem Services

How Biodiversity is helping us

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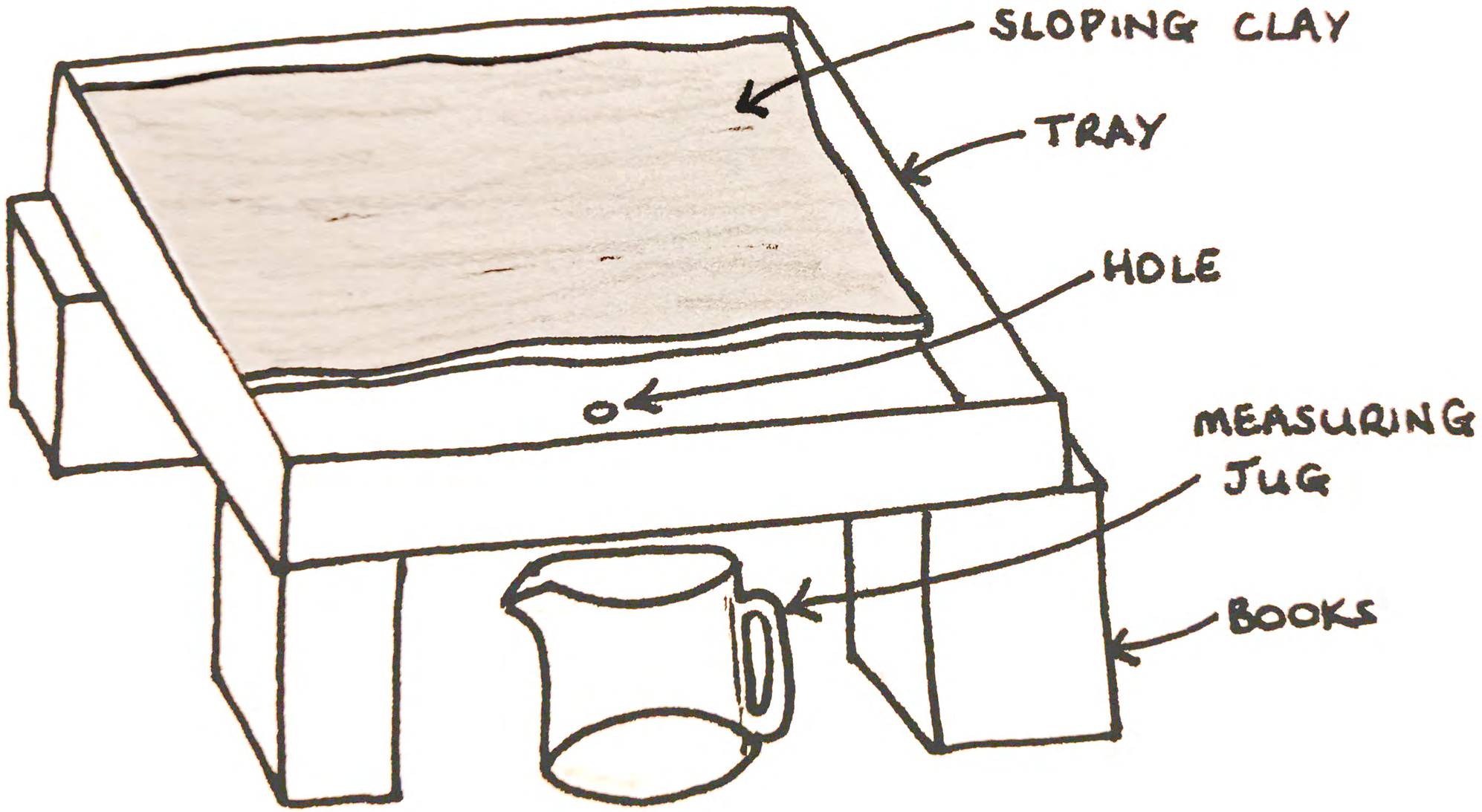
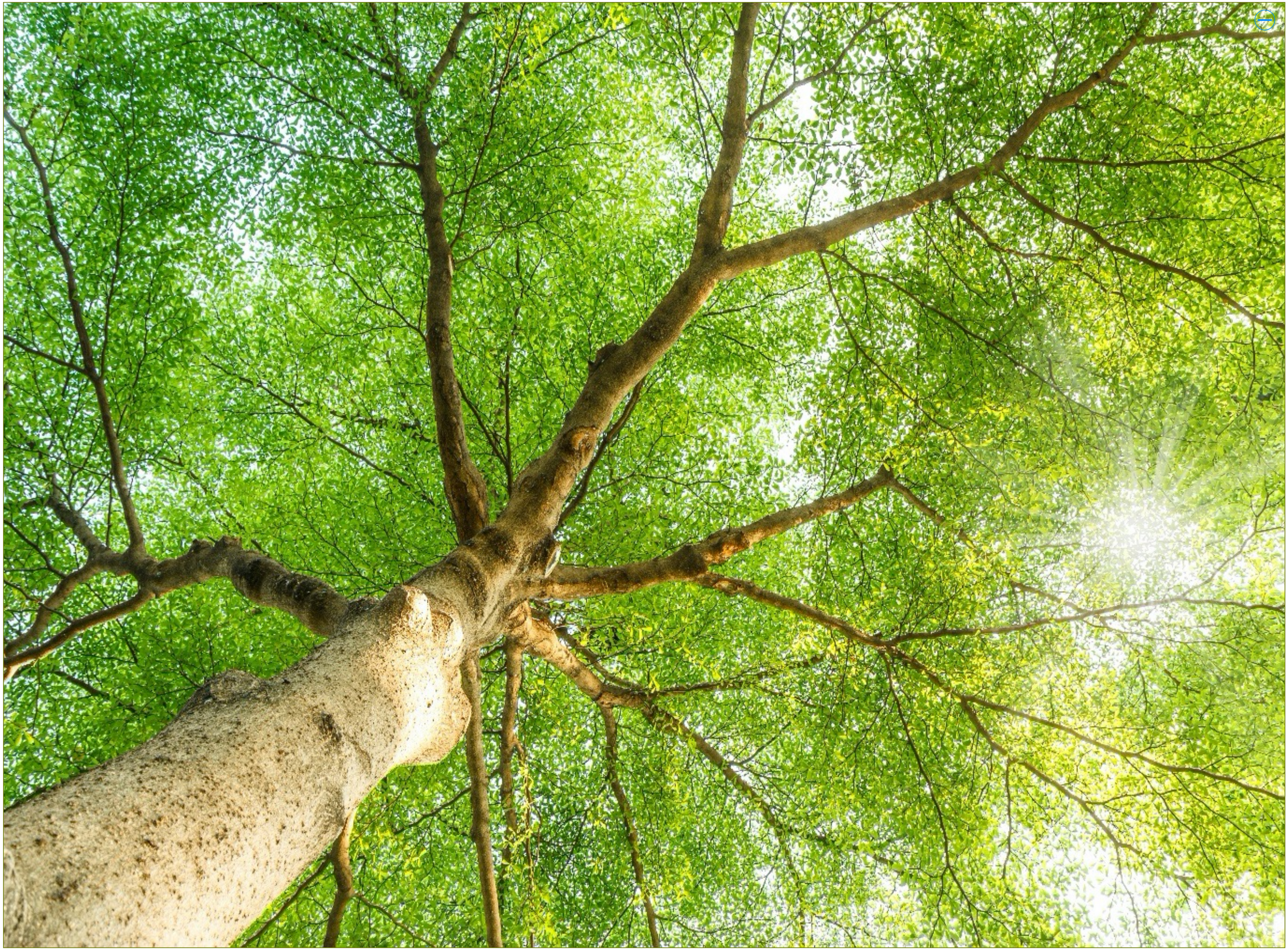


Materials:

Large, flat tray such as an aluminium baking tray, classroom air-drying clay, kitchen roll, two facecloths, pieces of sponge, toothpicks/ matchsticks, paper, pencils, two measuring jugs, water.



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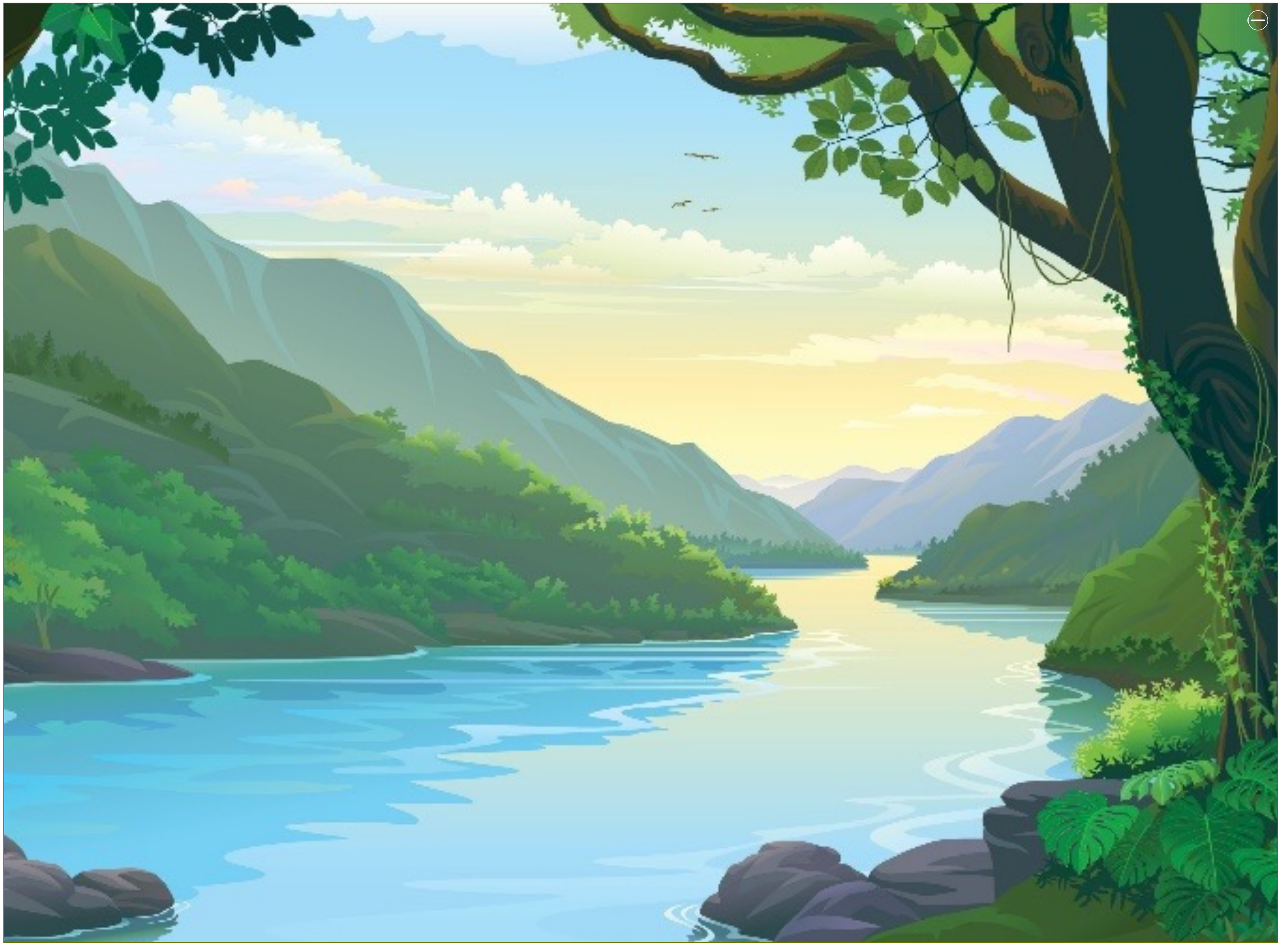

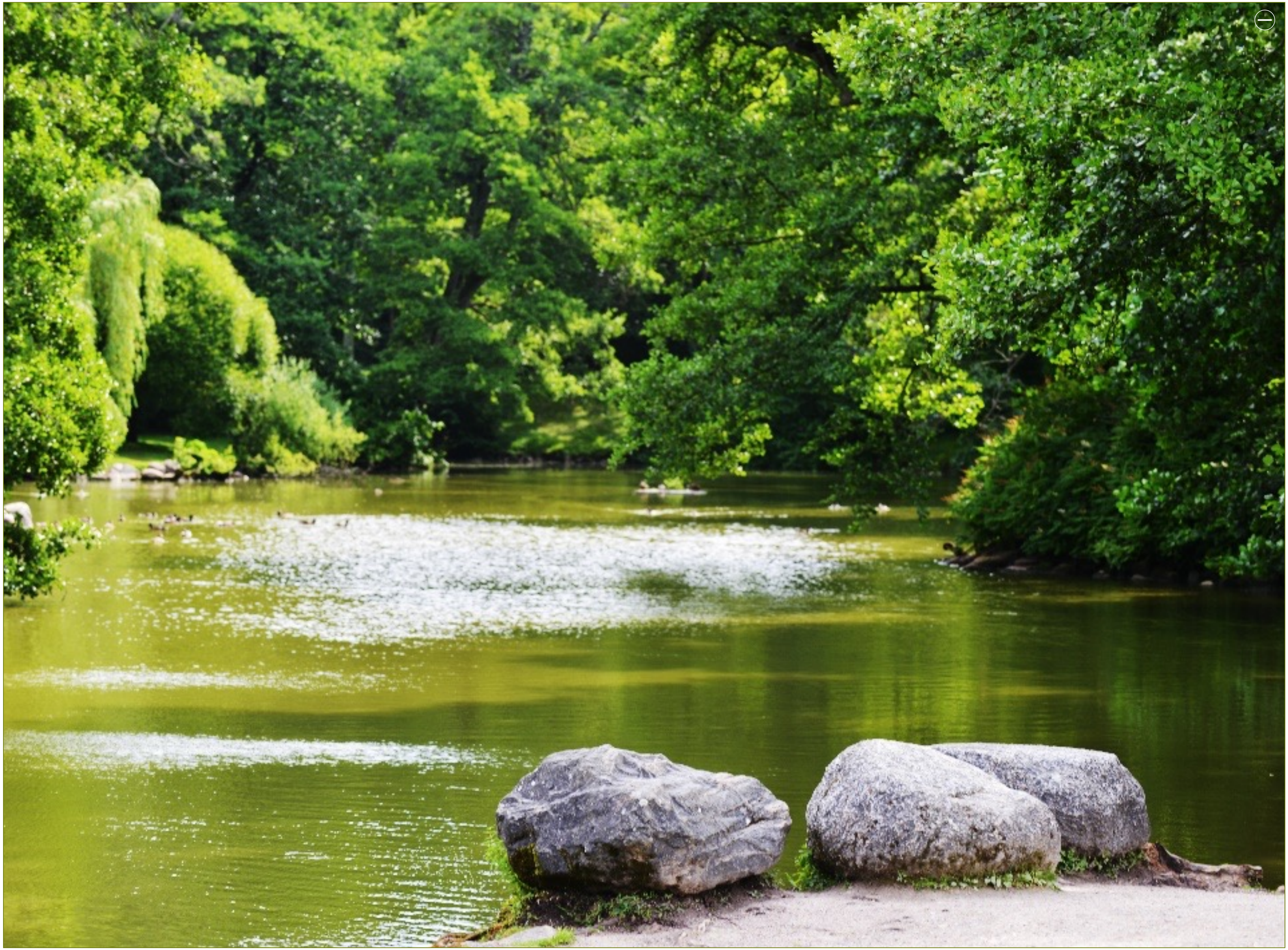

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