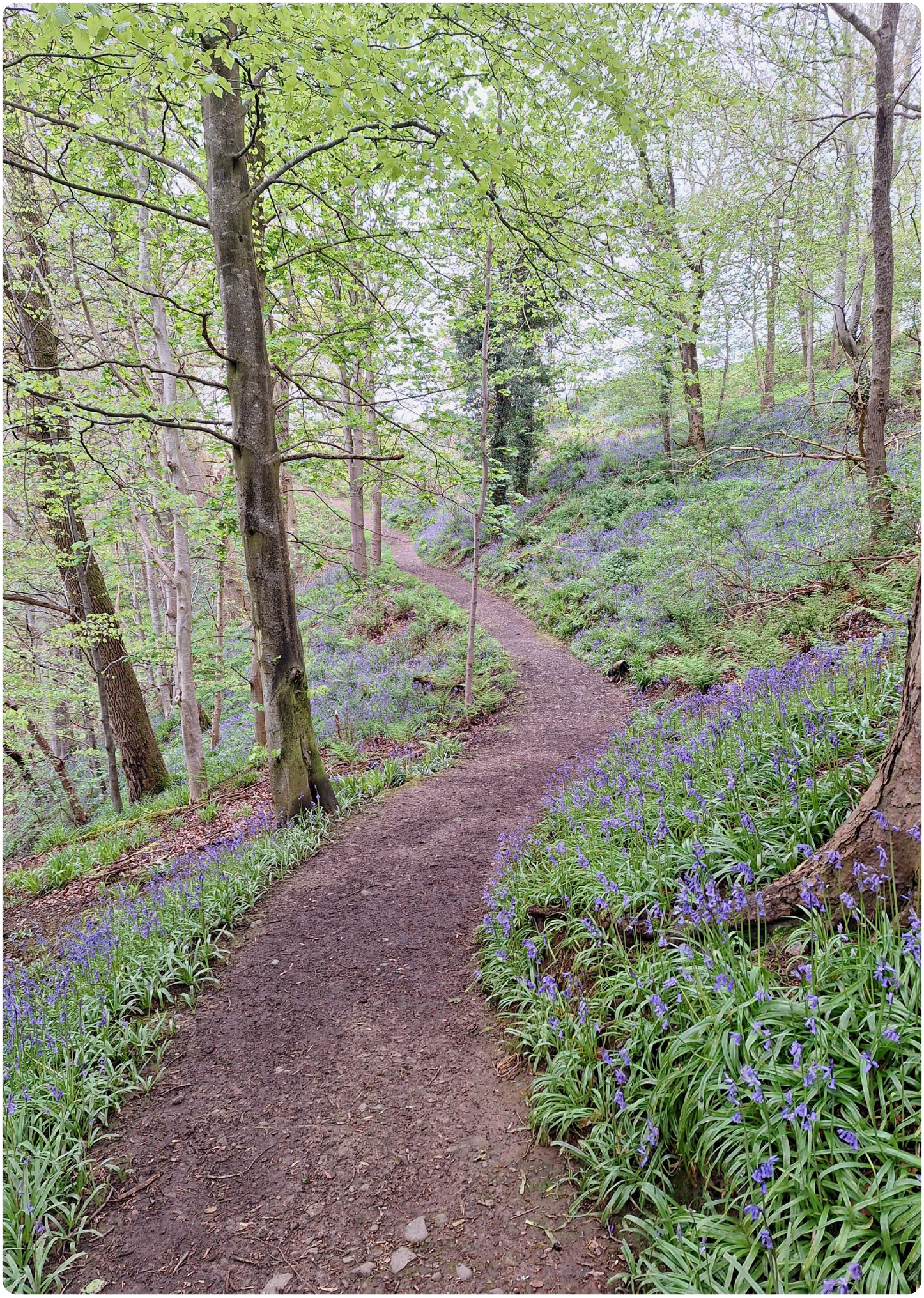
Riverbank Plants

Discovering the River Tweed and its Tributaries

Contents

Riverbank Plants | TweedWATCH Education Pack

SECOND LEVEL KS2



Introduction

Riverbank Biodiversity:
The Importance of a Healthy River and the Role of Riverbank Plants

A biodiverse riverbank, thriving with a diverse range of plant species, is vital to the health of a river ecosystem. It provides shelter and food for wildlife, protects the bank from erosion and keeps the river ecosystem strong and resilient to the impacts of disease, habitat fragmentation and global warming.

A loss of biodiversity of the riverbank leaves it vulnerable. The life that exists there is interconnected, having developed roles within the ecosystem over thousands of years. Where biodiversity has been drastically reduced, leaving only a small number of species, the loss of just one species can have devastating impacts. The activities in this section of the Education Pack encourage learners to consider the biodiversity of the plants growing on the riverbank of a local river spot. We will explore how some of these plants have adapted to live here and introduce one of biodiversity's biggest threats: **Invasive Non-Native Species**.

The lesson plans in this pack have been written with flexibility in mind. You can mix and match the activities that are relevant for your group or class, apply the techniques to any green space you have access to and carry out the activities over a timeframe that suits you. Some of the activities are seasonal, check the top of a Lesson Plan for an icon that shows the ideal season for the activities. If there isn't one, it's suitable any time of year.

Introducing Biodiversity: Resource Signposting – Short Videos

- **Our Planet: What is Biodiversity? (3m)** This visually striking short video from Our Planet introduces the concept of biodiversity and explains why it is essential for life on Earth. While it looks at biodiversity on a global scale, it also provides valuable context for exploring the diversity of plant life in your local environment.

- **Natural History Museum: What is biodiversity? (3m)** This short, animated film from the Natural History Museum explains what biodiversity is and why it matters. It highlights the variety of life on Earth and the way it supports healthy ecosystems. Again, the global perspective provides context while studying the diversity of local plants.

- **TED-Ed Lessons: The Threat of Invasive Species by Jennifer Klos (5m)** This animated Ted-Ed lesson by Jennifer Klos explores the threat of invasive species and the impact they can have on ecosystems worldwide. It explains how non-native plants and animals can spread rapidly, disrupting local biodiversity.

Check out the **TweedWATCH Education Pack Resource Signposting Padlet** for links to all of the resources referenced.

Tackling Threats to Biodiversity Along the River Tweed

Tweed Invasives Project

Tweed Forum launched its Tweed Invasives Project in 2002, initially focusing on giant hogweed, then also addressing Himalayan balsam, Japanese knotweed, and American skunk cabbage. Along with a team of fantastic volunteers, contractors, and landowners, Tweed Forum now operates one of the largest and most successful invasive non-native plant control programmes in the UK.

River Tweed Target Plant Species

Giant Hogweed

- A danger to human health, causing burns and blistering.
- Has purple, bristly stem and huge jagged leaves.

Himalayan Balsam

- Tall plant with striking pink flowers.
- Explosive seed pods that spread down the river.

Japanese Knotweed

- Tall plant with bamboo like stems.
- Fast growing, forming dense clusters of plants.

American Skunk Cabbage

- Large, bright yellow flowers.
- Establishes dense clusters of plants along the riverbank.

How can you help Tweed Forum fight the threat of invasives along the Tweed?

If you've sighted any of our target species, you can let us know by sending a photo of the plant/s, along with details of location, date and your name and number to **info@tweedforum.org**.

Photo credit: Emily Iles, Tweed Forum

Outdoor Learning Notes: Plants to Notice and Handle with Care

This guide shows some riverbank and woodland plants that teachers and group leaders should be aware of when taking learners outdoors. Each plant has a picture and a short note about why it could be hazardous. It's not a complete list, but it's a handy reference to help keep outdoor learning activities safe while exploring and learning about local plants.

Toxic or Harmful Plants

Some plants along riverbanks and in woodlands can be toxic if touched or eaten. While some can be observed safely without handling, in the case of highly hazardous species such as giant hogweed, teachers and group leaders may wish to avoid the area altogether and choose a safer spot for activities. It's important to make your learners aware of these plants so they can observe them safely without handling them.

Giant Hogweed: The sap can cause severe skin burns and eye damage. It is best to avoid areas where it is present.

Yew: A conifer tree with flat, dark green needles. It is toxic if eaten. If present, advise learners not to touch or collect natural items near this tree.

Foxglove: A tall plant with purple flowers. It is poisonous if eaten. Learners can look but not touch.

Stinging or Spiky Plants

These plants are usually common and easy to spot. They have tiny stinging hairs or sharp spikes, so it's good practice to make your learners aware of them before handling or exploring nearby.

Nettle

Thistle

Hawthorn

Bramble

You can find a more detailed list of potentially hazardous plants on the RHS website.

Hula Hoop Plant Survey

Lesson Plan

Learning Objectives

- Explain what biodiversity means and why it matters.
- Explore and identify different plants growing along a riverbank.
- Collect, record, and interpret data from a plant survey.
- Understand how invasive, non-native plants can affect riverbank biodiversity.

Ideal for Spring/Summer

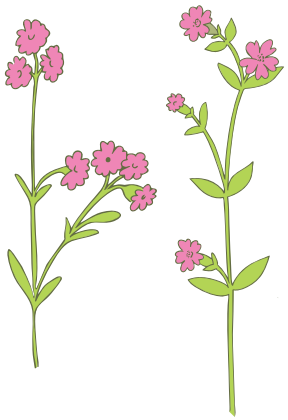
Equipment & Resources

- Clipboards, pencils, coloured pencils, plant identification app or printed resource (See DIY plant ID resource instructions for link to spotter sheets), hula hoops (or sticks & string)

Vocabulary

Biodiversity, ecosystem, sampling, invasive, native, introduced, species.

Introduction



Discussion: (20 mins)
Start the session by discussing the meaning of the word biodiversity and listing all the ways that it is important. Use the **Biodiversity Background Notes (p.10)** document for guidance on the questions you can pose to your group. There is also signposting for online video clips to support this on the Introduction page.

Activities

Riverbank Plant Hula Hoop Survey: (40 mins)
Introduce the activity by explaining that the class will be investigating the biodiversity of plants on the riverbank. Prompt discussion by asking why plants are important to the river ecosystem and why plant diversity matters. Explain that the survey will involve taking small, random samples to represent the whole area, rather than counting every plant. Emphasise that choosing spots carefully (for example, only choosing spots with the brightest colours) could give us the wrong picture of an area, so samples should be taken randomly.

For detailed instructions on how to carry out the survey/sampling, see the **Hula Hoop Plant Survey Activity Instructions (p.14).** This resource will also provide guidance on what data to record.

Working in small groups of 2 or 3, learners will need a copy of the **Hula Hoop Plant Survey Worksheet (p.26-28)** and the **Hula Hoop Quadrat Worksheet (p.29-30)**. Surveys can be completed without the quadrat if preferred, by just using the survey sheet during a riverbank walk as a spotter sheet.

Activities

Riverbank Postcard: (15 mins)
Create a riverbank plant souvenir that showcases the biodiversity of your local river spot. Try to include samples of the more common plants from your survey if possible, but be careful to avoid any spiky or toxic plants, as well as the seeds of invasive plants. Check the **Riverbank Postcard Activity Instructions (p.16)** for full details. During this activity, emphasise that handling plants with care and respect is part of protecting local wildlife and habitats.

Back at school

Making Sense of our Survey: (30 mins)
The survey results can give a general overview of the biodiversity of plants on your riverbank or chosen green space. Discuss with your learners the different ways to present the findings, depending on the information collected. For example, would bar charts or pictograms be suitable? If you recorded the number of plants for each species, learners could calculate the percentage of each type of plant and display them as a pie chart.

Encourage your learners to consider questions such as: Is there roughly the same amount of each plant, or are some plants much more common? Why might this be, and what does it tell us about biodiversity? For example, some plants are widespread because they can cope with a wide range of conditions, while rarer plants may need specific habitats, showing us how many different kinds of life the riverbank can support.

Invasive Non-Native Species – Species Spotlight: (45m)
Was there a plant species found during your survey that was much more common than the other types of plants? Is this plant classed as an Invasive Non-Native Species, and is it impacting the biodiversity of the riverbank? Investigate this further by tasking your group to research this plant and to create their own Species Spotlight Fact Page. Learners can use the **Species Spotlight Worksheet (p.31-33)** to guide their research, as well as the **Himalayan Balsam Species Spotlight page (p.18)** as an example of an invasive non-native species.

**Note, you may find that a native species has dominated the area, like nettles or thistles. These tend to be generalist plants that have adapted to a wide range of habitats. They are a vital part of an ecosystem, but in large numbers they could push out other species. In certain areas where they have grown out of control, they could be considered problematic.*

Reflection questions

- What other surveys or investigations could you do with these methods?
- If invasive non-native plants are harming the riverbank, what could we do to help? E.g. plant natives, avoid spreading invasive seeds, report sightings, or make awareness posters.
- Why is biodiversity important? Why is it good to have many different types of plants? E.g. it provides varied food and shelter for wildlife and keeps the ecosystem strong and balanced.

Biodiversity and the Riverbank

Background Notes

What is biodiversity?

The term biodiversity broadly means the variety of living things on Earth and can be used as a measure of the range of life in a specific area. This can refer to the range of ecosystems, to the genetic variety present in the individuals within a species, or most commonly it describes the variety of species.

Why is biodiversity so important?

Our lives are intertwined with nature, it is vital to us as humans as well as to all living beings on earth. Nature without healthy levels of biodiversity cannot provide the benefits needed for our world to thrive. An ecosystem or any habitat that is rich in different species interacting together is a strong and healthy one.

Ecological benefits
Biodiversity keeps the world in balance and is vital for the health and vitality of our world's ecosystems. It sustains the quality of our air, water and soil. It provides pollination services, decomposes dead material, and even reduces the impacts of natural disasters and disease.

Reducing global warming
Ecosystems rich in biodiversity are stronger and more resilient to the impacts of climate change. Some types of ecosystems can even actively reduce the levels of global warming by acting as carbon sinks. Areas of woodland, peatland and the ocean all absorb and store carbon, keeping it out of the atmosphere.

Health and wellbeing benefits
Natural environments with high levels of diversity provide stimulation and engagement with the senses and opportunities for mindfulness. Being close to nature and trees in particular can be hugely beneficial to our physical health, reducing blood pressure and stress whilst boosting our immune systems.

Enjoyment and learning
Biodiverse ecosystems provide opportunities for people to have fun; hiking, swimming, den building, photography, and bird watching are just a few of the activities that benefit from biodiversity.

Human survival
Biodiversity is essential to supporting our survival needs. It provides humans and other living beings with nutritional food, medicines, energy and clean freshwater.

What is the importance of biodiversity along the riverbank?

Plant diversity is essential to the health of a riverbank ecosystem. The variety in characteristics and growing seasons of a range of native species can provide a wealth of benefits throughout the year:

- Provide habitats for a range of animal species, many of which rely on riverbank plants for food, shelter and a place to reproduce.
- Act as wildlife corridors to support movement for animals between different ecosystems, allowing more opportunities to find food and breed. This, in turn, keeps the genetic diversity of those species at a healthy level.
- Plant roots stabilise the bank by binding it together, preventing erosion of the soil into the river. The roots also take up water from the ground, reducing the amount and speed of the water flowing into the river, reducing flooding.
- The leaves and branches of taller plants lessen the impact of heavy rainfall, washing away the soil, further reducing soil erosion.
- Some plants act as windbreakers, slowing down the speed of the wind and reducing the amount of topsoil getting blown away. Trees are especially good for this due to their deep roots and large branches, as are the small, creeping plants that can provide good groundcover.
- Plants act as a barrier to pollutants entering the river.
- The taller plants and trees provide shade, keeping the water cool for the fish and invertebrates that live within it.

Image: Pixabay

Biodiversity loss

Life on Earth has evolved over billions of years. It has grown in complexity over that time, producing intricate ecosystems of diverse organisms that are interconnected and interdependent. The biodiversity of these ecosystems is what makes them strong and resilient in the face of change.

All over the planet, we are facing a serious decline in biodiversity. The WWF's Living Planet Report for 2024 reports that on average there has been a 73% reduction in wildlife populations since the 1970s (referring to animal populations that have been monitored over that time). The strongest decline being that of freshwater ecosystems!

Habitat loss and degradation driven by human activity is reported to be biodiversity's biggest threat, although it is also threatened by climate change, overexploitation, disease and invasive species. The Riverbank Plants topic aims to engage young people in the issue of invasive plant species and their impacts on biodiversity loss along the River Tweed.

What can we do to take action against biodiversity loss?

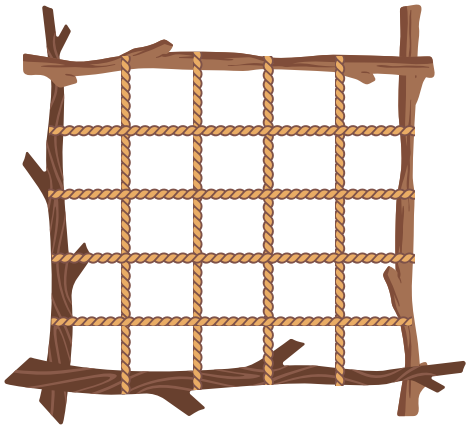
Biodiversity loss can seem impossible to tackle, but if we work together, even the smallest changes can make a big difference. We can make sure the items we buy don't harm biodiversity either when they are produced or when they are discarded. We can restore and protect local habitats, e.g. plant trees and pollinator-friendly native plants in school grounds. We can work to reduce our carbon emissions and also learn as much as we can about nature, whilst sharing the message of protecting biodiversity with others.

Stick Quadrat

DIY Resource Instructions: For Teachers

Description

A quadrat is used for surveying plants and invertebrates suitable for nearly any accessible green space. Create your own square quadrat with sticks and string to help build your outdoor kit. You can also try this as an activity with a small group to practise measuring and knot tying, whilst improving fine motor skills.



What you'll need

- 4 sticks (approx forearm length)
- Secateurs, loppers or a pruning saw
- Twine/string
- Scissors
- Measuring tape
- Marker pen

Instructions

- Find 4 sticks just over 50cm in length and remove any leaves or stick-out pieces with secateurs.
- Place them down on a flat surface in a rough square shape.
- Use the measuring tape to mark a 50cm section of each stick and mark each 10cm interval. There should be an overhanging length on either side.
- Use a lashing knot to tie the first 2 sticks together at a right angle, making sure to match up to the outer marked measurements. Repeat this for all 4 corners of the square.
- Tie your string onto one of the 10cm markings on one side of the square, pull it tight and attach it to the opposite marking. Repeat this 3 more times in the same direction and then add the strings in the same way on the perpendicular side. You may wish to weave the string on the second side through the first side of the string for extra stability.

Lashing: Step by step

Tie your twine to one of the sticks.

Wrap the twine over and under the sticks 3 times.

Wrap the twine between the sticks 3 times, pull tight.

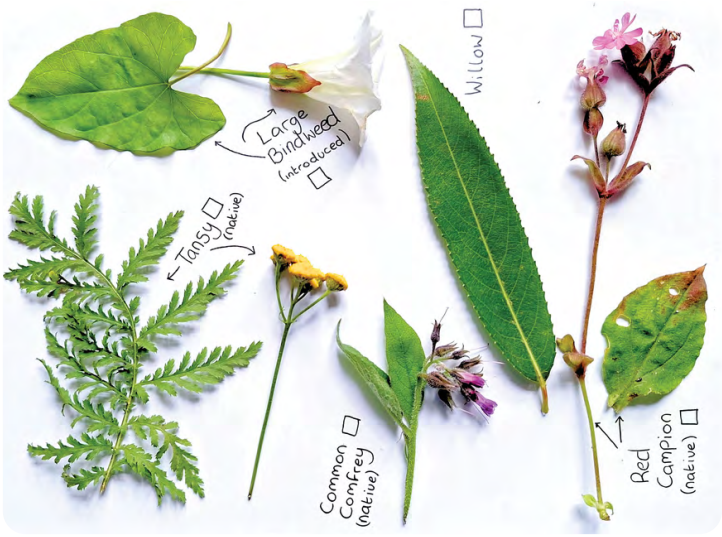
Secure the twine with a knot round one of the sticks.

DIY Plant ID Resources

DIY Resource Instructions: For Teachers

Description

Create a site-specific plant identification resource for your class by carefully collecting and photocopying a small sample of local plants.



What you'll need

- Bag or bucket to collect samples
- Gloves (optional)
- White card
- Black pen
- A plant identification App or resources available online
- A camera or access to a scanner or photocopier

Instructions

- Photograph or collect a sample of plants from the local area. If picking plants, be mindful to take only one of each type and only if there are at least twenty individual plants present. You'll want to pick a leaf and a flower if it's the right time of year. Make sure to leave the rest of the plant intact.
- If you'd like to take a sample of a nettle or a thistle, you can handle these using sturdy gardening gloves to prevent stings.
- Place the white card on your scanner/photocopier and arrange your plant samples. Group flowers with their matching leaves and leave space for labels.
- Close the lid, scan the plants and then print the document.
- Use your plant identification App and resources to label the plants clearly and mark at the top of the page the location and month.
- If collecting a selection of images, cut and paste these into a overview slide.

Identification Resources

Apps that use image recognition technology

- SEEK by iNaturalist: Helps to identify plants and animals and provides information about whether the species is native or introduced.
- PlantNet: You can download this App for out-and-about identification, or you can use their website to identify photographs.

Spotter Sheets Online

- Botanical Society of Britain & Ireland: BSBI has a great collection of resource signposting for people starting out with plant identification. It includes handy hints, spotter sheets and blog posts.

Hula Hoop Plant Survey

Activity Instructions

Description

Learn more about your local plants and the levels of biodiversity in your local riverbank spot, using this hula hoop survey activity. These techniques are transferable to different habitats, including a school playing field, a local grassland or even a garden.

What You'll Need

- Hula hoops (1 per group of 2/3)
- Clipboards and pencils
- Hula Hoop Survey Worksheets
- Plant identification resources
- Tape measures
- Camera/s (optional)
- 2 long measuring tapes, cones or ribbons (optional)

Instructions: Setting Up

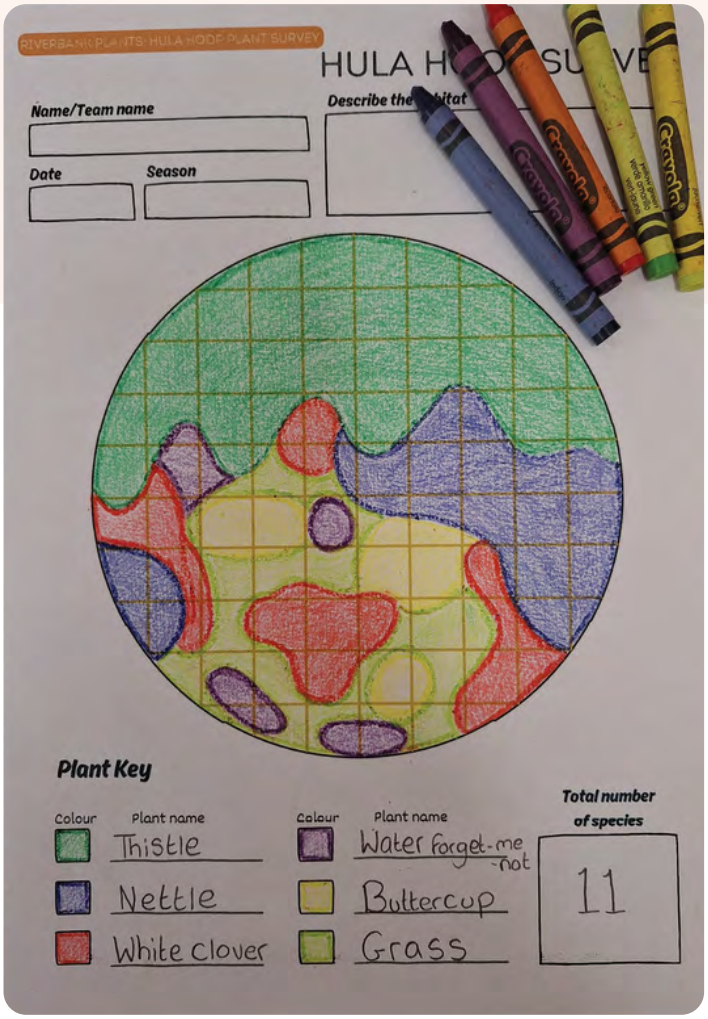
1. Firstly, decide where you would like to carry out your survey. This activity is written to be carried out in an area of riverbank vegetation. However, if you are not within walking distance of a river, you can choose any local green space that isn't densely packed with trees.
2. Once you've arrived, organise your learners into small groups of two or three and hand out a hula hoop, clipboard, pencil, and a copy of the hula hoop survey sheets to each group. If you would prefer to use a square quadrat, please see the **Stick Quadrat Activity Instructions (p.12)** sheet on how to make your own.
3. Learners need to place their hula hoops randomly. This is to prevent preferences and judgments from affecting the results. Do this by either throwing the hoops (making sure not to hit anyone) or by using random coordinates.
4. If using the coordinate method, set up a grid by laying two measuring tapes at right angles to each other. The size will depend on how much space you have, but aim for each axis to be 20m in length if possible. Ask two group members to pick a number from 0 to 20. Each person will stand by their numbers in metres on the tape and then walk into the grid until they meet each other. This is where they will place their hoop.
5. If learners have a camera, they could take a photograph of their hula hoop for later reference – one photo from above and one that takes in the surroundings.

Instructions: What to Measure

Number of plant species
Count how many different kinds of plants you can see within the hoop. The more types of plants you find, the higher the species richness, which is one way of describing biodiversity. This gives us a simple measure to compare plant life between different areas. However, it doesn't tell us how balanced the mix is (whether one plant is more common or dominant than the others). To get an average value for the whole survey area, add up the number of species for each hoop and divide by the number of hoops used.

Number of individuals of each species
Counting how many plants of each type are inside the hoop helps us see how evenly the species are spread out. This is called 'evenness'. You can show the results with simple bar charts or pictograms, or turn the numbers into percentages to compare them more easily. This will highlight which plants are common, which are rare, and whether any species are dominating the area. The more balanced the mix, the greater the biodiversity. If a plant is too numerous to count, learners can make a sensible estimate instead.

Proportion of space taken up by each species
Sometimes counting individual plants isn't practical, especially if they are very small, very numerous, or not in flower. In this case, learners can estimate how much space each type of plant covers within the hoop. Learners can colour in the grid on the **Hula Hoop Survey Worksheet** to represent each plant type, focusing on 6 or fewer species to keep things simple. If your class is using square quadrats instead of hoops, learners can work out the percentages since each smaller square represents 4% of the total area. If you'd prefer your group to colour once back indoors, they can mark each area drawn with the relevant initials of each plant and finish later.



Investigation Ideas

These techniques are a basic introduction to gathering information about the biodiversity of plants. Your group will likely have their own ideas and questions regarding topics you could investigate, but here are a few ideas to get you started:

- Comparing 2 different areas along the river (e.g. town vs countryside, or a straight section vs a meander).
- Comparing the types of plants found in 2 different ecosystems.
- Comparing biodiversity before and after your group has taken action (planting wild flowers, removing Himalayan balsam, adding deadwood habitat, etc).

Riverbank Postcard

Activity Instructions

Description

Ask your learners to create a plant-themed souvenir, celebrating their trip to the river. This postcard activity aims to display the range of species present at the riverbank whilst encouraging your class to observe nature a little closer.

What you'll need

- Scrap cardboard or coloured card
- Double sided tape

Instructions

- Cut up your card/cardboard into similar, palm-sized rectangles.
- Add a strip of double-sided sticky tape along the middle of the card.
- Hand them out to your learners, explaining that we will be creating our own riverbank postcards. They will display a snapshot of the variety of plant life growing beside the river at that time of year. If you have a large group/ class, ask your learners to work in teams to reduce the number of plants being picked.
- Ask your group to peel off the tape cover from the sticky strip and hand it to you before exploring what plants to select. Remind them to avoid the jaggy plants like nettles and thistles.
- When finished, they can press the postcards between heavy books/wood blocks if you'd like to preserve the plant samples for longer.

Environmental Considerations

It's important to stick to the following UK rules around picking plants and flowers in the countryside.

- Don't pick flowers that are privately owned, critically endangered or protected (e.g. bluebells or snowdrops).
- Only pick flowers if they are growing in abundance, an example is the 'pick only 1 in 20 rule'.
- Leave most of the plant unharmed (especially the roots) so it is still able to grow and thrive.
- Get landowner permission if you are on private land.

Also, ask your learners to avoid the invasive non-native plants (see the plants highlighted in this pack) and to consider the availability of food for pollinators when picking flowers.

Back at school

Literacy and English Exercise:
Learners can write a postcard to describe their visit to the river. What did they observe, and how did it make them feel?

Image: Pixabay

Species Spotlight: Plants

Himalayan Balsam

Species Name: Himalayan balsam
Scientific Name: Impatiens glandulifera

Type of Plant

UK Native	☐	Invasive	☑
Introduced	☑	Not a threat	☐

History

As its name describes, Himalayan balsam is native to the Himalayas, a mountain range in Asia that includes the highest peak in the world, Mount Everest. It was introduced to the UK in 1839 as a garden plant, admired for its beauty. It quickly spread into the wild.

Habitat

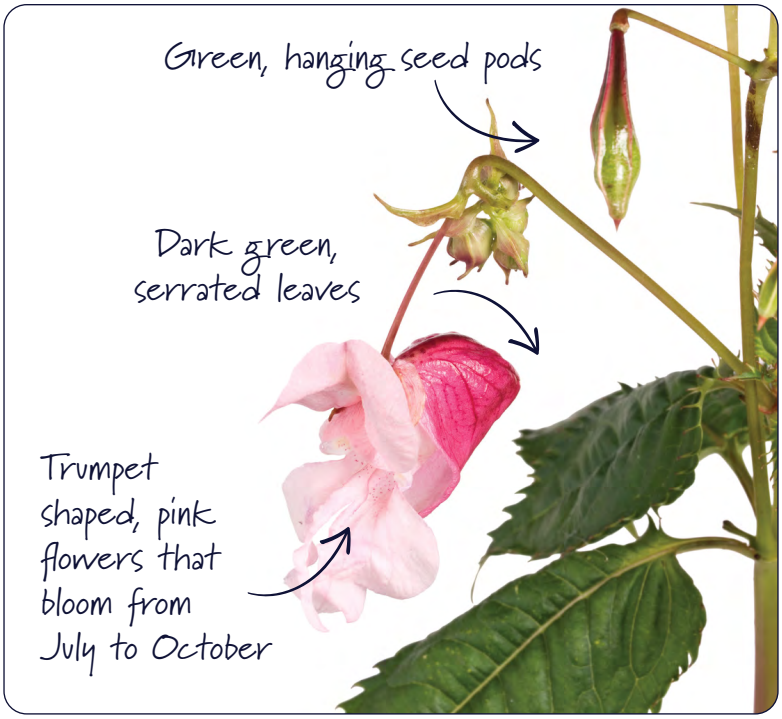
Himalayan balsam grows mostly in damp habitats, including riverbanks, ditches, and damp woodlands. It doesn't need a lot of light to survive and even prefers areas that are semi-shaded.

Interesting Facts

- Other names used for this plant include: Policemen's helmet, Indian balsam and Kiss-me-on-the-mountain.
- Himalayan balsam seeds also hitchhiked into the UK on imported wool!

Identification tips

One of the tallest riverbank plants, growing up to 2 metres in height



Flowers have a sweet smell

Invasive Non-Native Species: Himalayan Balsam

What advantages does this species have over native plants?

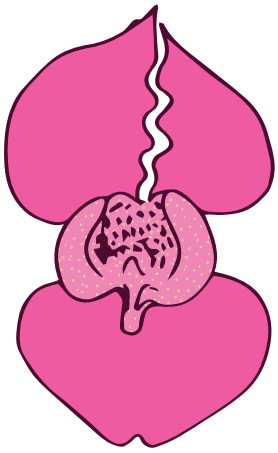
Himalayan balsam's success is all down to its clever seed dispersal strategy.

- The seed pod dries as it ripens, making it extra sensitive. The lightest of touches can cause the pod to split, launching the seeds as far as 7 metres from the plant.
- One plant can produce a massive 800 seeds every year!
- The seeds can float in water, increasing the distance they can spread as they are carried downriver.
- When the seeds land on soil, they can survive for up to 2 years!

Himalayan balsam seed pods

What impacts does this species have on riverbank biodiversity?

- Outcompetes native plants, reducing the biodiversity along our riverbanks.
- Their shallow root systems provide little help in stabilising the riverbank. When the plants die back in the winter, riverbanks are left bare and vulnerable to erosion.
- As Himalayan balsam grows in dense clumps, it can restrict the flow of water during heavy rainfall and increase the chances of flooding.
- Its flowers make lots of nectar and attract local pollinators away from the native plants.



What can be done to control this species?

Himalayan balsam plants can be pulled out of the ground by hand. The roots are shallow and don't take too much effort to remove. It is important to do this before the seed pods have ripened, otherwise the seeds will spread.

Tweed Forum has been working with CABI (an organisation that focuses on agricultural and environmental issues) to trial a way to control this super spreader by getting help from a natural enemy, a type of plant disease called rust fungus. This rust fungus only targets Himalayan balsam, damaging its leaves and affecting the growth of its seeds, leaving our native plants untouched.

This Himalayan balsam leaf has been infected by rust fungus

Image: Tweed Forum

Species Spotlight: Plants

Giant Hogweed

Species Name: Giant hogweed
Scientific Name: Heracleum mantegazzianum

Type of Plant

UK Native	☐	Invasive	☑
Introduced	☑	Not a threat	☐

History

Giant hogweed is native to the Caucasus Mountains (a mountain range that is home to the highest peak in Europe, Mount Elbrus). It was introduced to the UK as an ornamental garden plant in the 19th century, before it spread into the wild.

Habitat

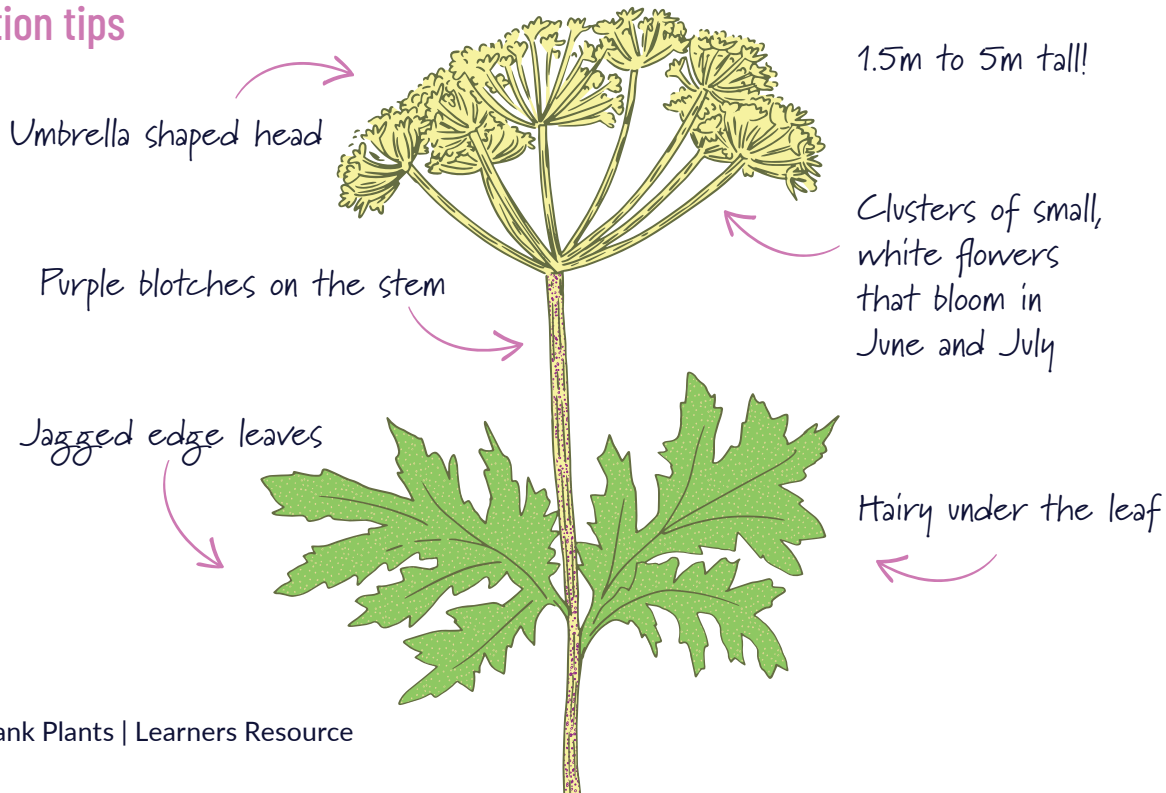
Widespread throughout the UK, growing mainly in these habitats:

- Lowland rivers
- Rough pastures
- Wasteland

Interesting Facts

This plant contains phototoxic chemicals that can cause severe burns and blisters to our skin when exposed to sunlight. This means it is important to never touch this plant and not allow dogs to touch it either!

Identification tips



Invasive Non-Native Species: Giant Hogweed

What advantages does this species have over native plants?

Giant hogweed reproduces only once in its lifetime, though when it does, it can produce up to 50,000 seeds per plant. Once dispersed (usually by water), the seeds can live in the soil for several years, waiting for the right conditions to grow. Once established, this species can quickly dominate an area. Its dense growth and large leaves block much sunlight from reaching the ground. With fewer competitors for water and nutrients, it gains an even stronger advantage.

Giant hogweed seeds

What impacts does this species have on riverbank biodiversity?

- It is a danger to human health, causing severe burns and blisters.
- It outcompetes native plants as its huge size and dense growth dominate the landscape.
- When the plants die back in the winter, the riverbank soil is left bare and is vulnerable to erosion from rain, river water and wind.

What can be done to control this species?

Tweed Forum Invasive Non-Native Species (INNS) Programme

- Every year, a huge team of staff, volunteers and contractors check many of the waterways in the Tweed catchment for giant hogweed.
- Control work begins in the upper parts of the river to stop seeds from spreading to areas that have already been cleared.
- Workers wear protective clothing when dealing with these plants, using a sprayer to apply herbicide.
- People can help with our work by letting us know of any sightings of giant hogweed in the River Tweed catchment by emailing **info@tweedforum.org**

Tweed Forum INNS Project Officer Emily Iles working to control giant hogweed

Image: Emily Iles, Tweed Forum

Species Spotlight: Plants

American Skunk Cabbage

Species Name: American skunk cabbage
Scientific Name: Lysichiton americanus

Type of Plant

UK Native	☐	Invasive	☑
Introduced	☑	Not a threat	☐

History

American skunk cabbage is native to western North America. It was brought over to the UK in 1901 to be planted around garden ponds. It spread from people's gardens and was first reported growing in the wild in 1947. It was banned for sale in the UK in 2016.

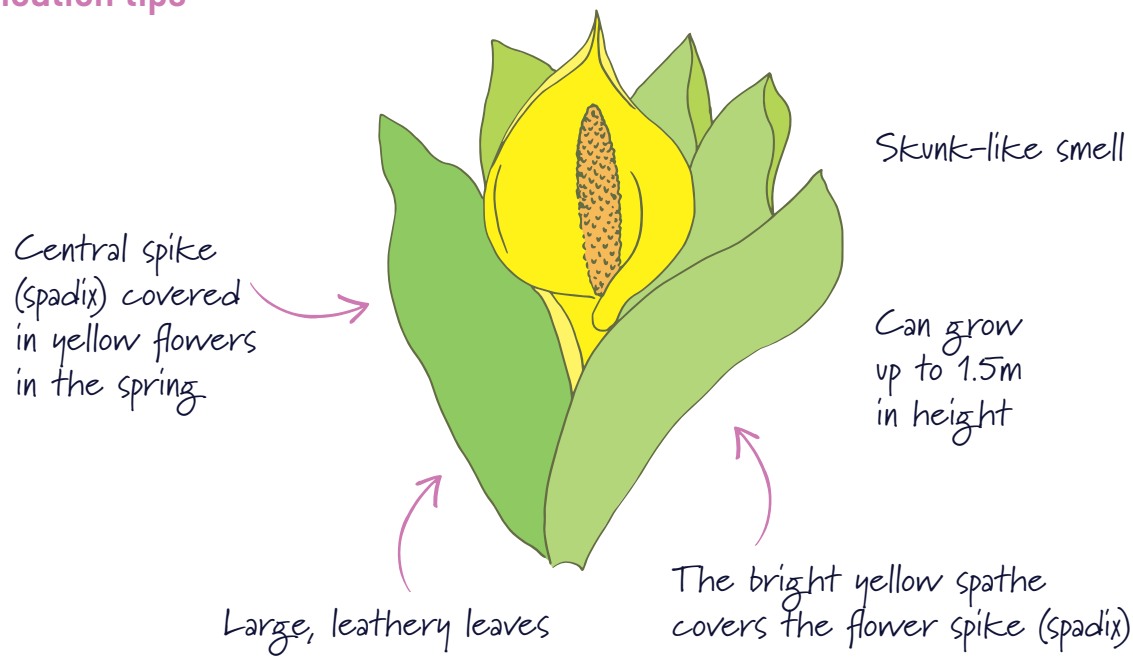
Habitat

Likes wet areas and can grow in any type of soil. It grows very well in wet woodlands, bogs, streamside, and pond margins.

Interesting Facts

- Skunk cabbage looks similar to the UK native lords-and-ladies plant.
- Individual plants can live for decades!

Identification tips



What advantage does this species have over native plants?

- American skunk cabbage can grow in many types of soil, in shade or full sun and even in disturbed ground.
- It can thrive in waterlogged soil where some native plants would struggle to survive.
- Each flower spike produces lots of seeds, and the plant also spreads through rhizomes. Rhizomes are underground stems that send out roots and help the plant spread to new areas.
- Its large leaves capture lots of light for making food, while shading smaller plants growing on the ground.
- It flowers early in the year, before many native plants, giving it a head start in taking up nutrients and light.

What impact does this species have on riverbank biodiversity?

- American skunk cabbage grows quickly and takes up a lot of space, leaving less room for native plants. Its big leaves block light, so smaller plants struggle to grow.
- Fewer types of plants can grow in an area full of American skunk cabbage because it spreads so quickly, which means there is lower biodiversity.
- When American skunk cabbage dies back in winter, its large leaves and stems leave a lot of rotting material that can block small streams, making it harder for creatures that rely on flowing water to survive.

What can be done to control this species?

Tweed Forum Invasive Non-Native Species (INNS) Programme

Tweed Forum has trialled several different ways to control American skunk cabbage during the Invasive Non-Native Species Programme. It was found that manually digging out plants by the roots worked well for small patches, with larger patches needing treatment with chemicals to the leaves and roots.

Tweed Forum INNS Project Officer Emily Iles, working to control American skunk cabbage

Image: Emily Iles, Tweed Forum

Species Spotlight: Plants

Japanese Knotweed

Species Name: Japanese Knotweed
Scientific Name: Fallopia japonica

Type of Plant

UK Native	☐	Invasive	☑
Introduced	☑	Not a threat	☐

History

Japanese knotweed was introduced to the UK in the 19th Century. It was brought over from Japan to be used as an ornamental garden plant. It was admired for its tall stems and pretty, white flowers. It has spread rapidly throughout the UK.

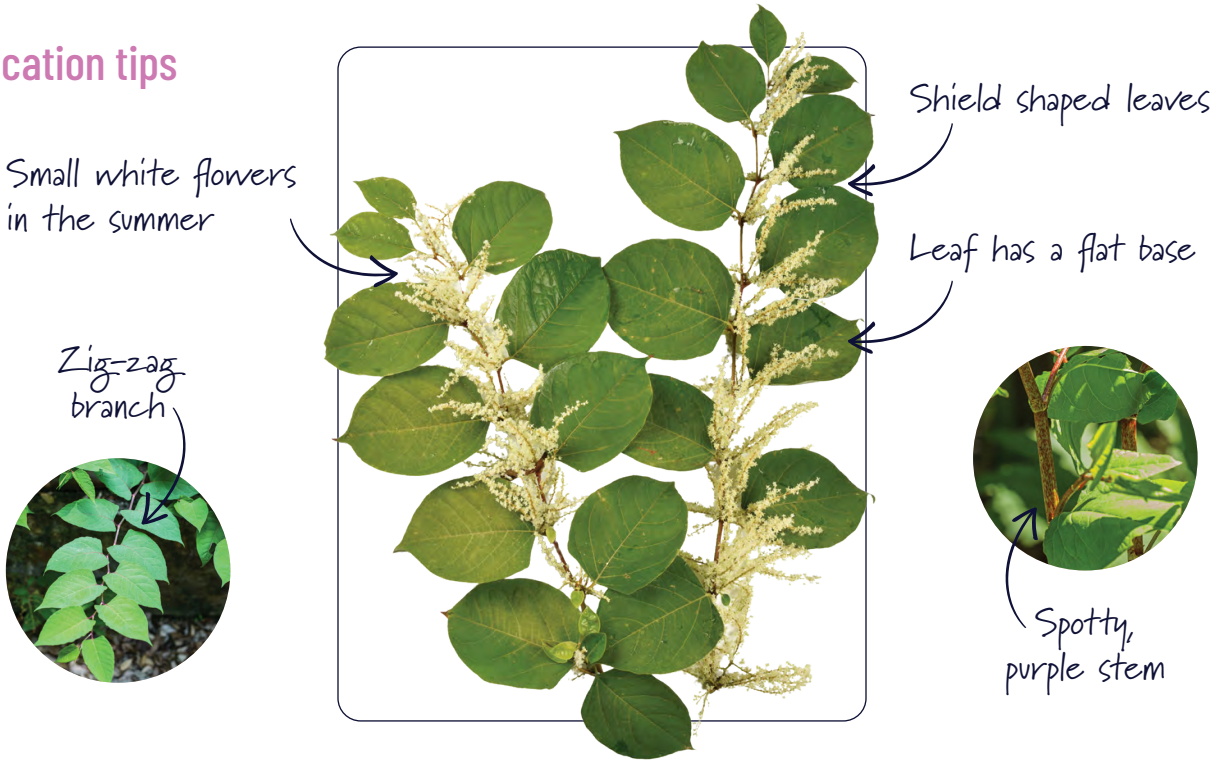
Habitat

These plants like to grow in damp places, such as riverbanks and canals, though they can survive almost anywhere.

Interesting Facts

- Japanese knotweed can grow up to 10cm in a single day.
- Even a tiny piece of root can grow into a whole new plant.
- It is so strong it can even grow through tarmac!

Identification tips



Invasive Non-Native Species: Japanese Knotweed

What advantages does this species have over native plants?

- It grows very quickly in the spring and summer, up to 3 metres tall.
- These fast-growing, dense groups block the sunlight from smaller plants below.
- Knotweed is very tough and hard to get rid of once it has started growing.
- It is famously strong. Its rhizomes can push up through cracks in pavements, roads and even through the foundations of buildings.
- It spreads through rhizomes (underground stems that grow roots and shoots) and can form thick groups.

What impacts does this species have on riverbank biodiversity?

- Japanese knotweed blocks out light so that other plants cannot grow underneath it.
- Because it spreads so fast and crowds out other plants, fewer species are able to survive, which means lower biodiversity.
- With fewer types of other plants, there is less food and shelter for insects, birds and other wildlife.
- When Japanese knotweed dies back in the winter, it leaves bare ground with little cover, which can make riverbanks more open to erosion. This can lead to water pollution in the river.

What can be done to control this species?

Japanese knotweed is very hard to get rid of. If even a tiny piece of root is left behind it can grow into a new plant. It usually has to be removed by experts using special methods. It is illegal in the UK to plant Japanese knotweed or let it spread into the wild. We can help the experts by not touching it and being careful not to spread it by accident. We can also tell an adult who can report it, so the experts know where it is and can deal with it safely.

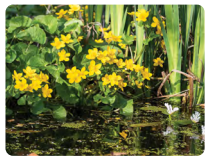
Riverbank Plant Survey

Location:	Team Name:	Weather:

Spring

Native

	Species name:	Number found:
	Marsh valerian	
	Common bistort	
	Dog violet	
	Cuckooflower	
	Dandelion	
	Wild garlic	

	Species name:	Number found:
	Germander speedwell	
	Greater stitchwort	
	Garlic mustard	
	Marsh marigold	
	Common vetch	
	Common bluebell	

Introduced

	Species name:	Number found:
	Few-flowered leek	
	Rhododendron	
	Three cornered garlic	
	American skunk cabbage	
	White butterbur	
	Spanish bluebell	

Some of these plants aren't usually classed as waterside plants, but can be seen in habitats around the river including river woodland and grassland. Look for the waterdrop to see plants that thrive in the wet soils at the river's edge.

Riverbank Plant Survey

Location:	Team Name:	Weather:

Summer

Native

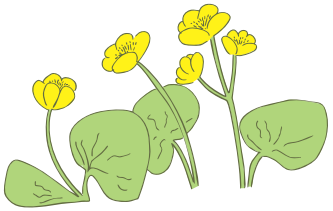
	Species name:	Number found:
	Great willowherb	
	Water mint	
	White clover	
	Tansy	
	Common knapweed	
	Common comfrey	
	Creeping buttercup	
	Yellow iris	
	Water forget-me-not	
	Ragged robin	
	Meadowsweet	
	Red campion	

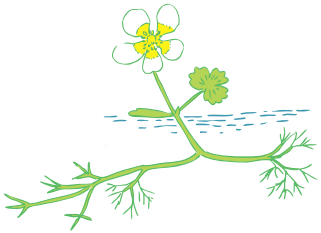
Introduced

	Species name:	Number found:
	Himalayan balsam	
	Giant hogweed	
	Parrot's feather	
	Snowberry	
	White butterbur	
	Rhododendron	

Some of these plants aren't usually classed as waterside plants, but can be seen in habitats around the river including river woodland and grassland. Look for the waterdrop to see plants that thrive in the wet soils at the river's edge.

Riverbank Plants





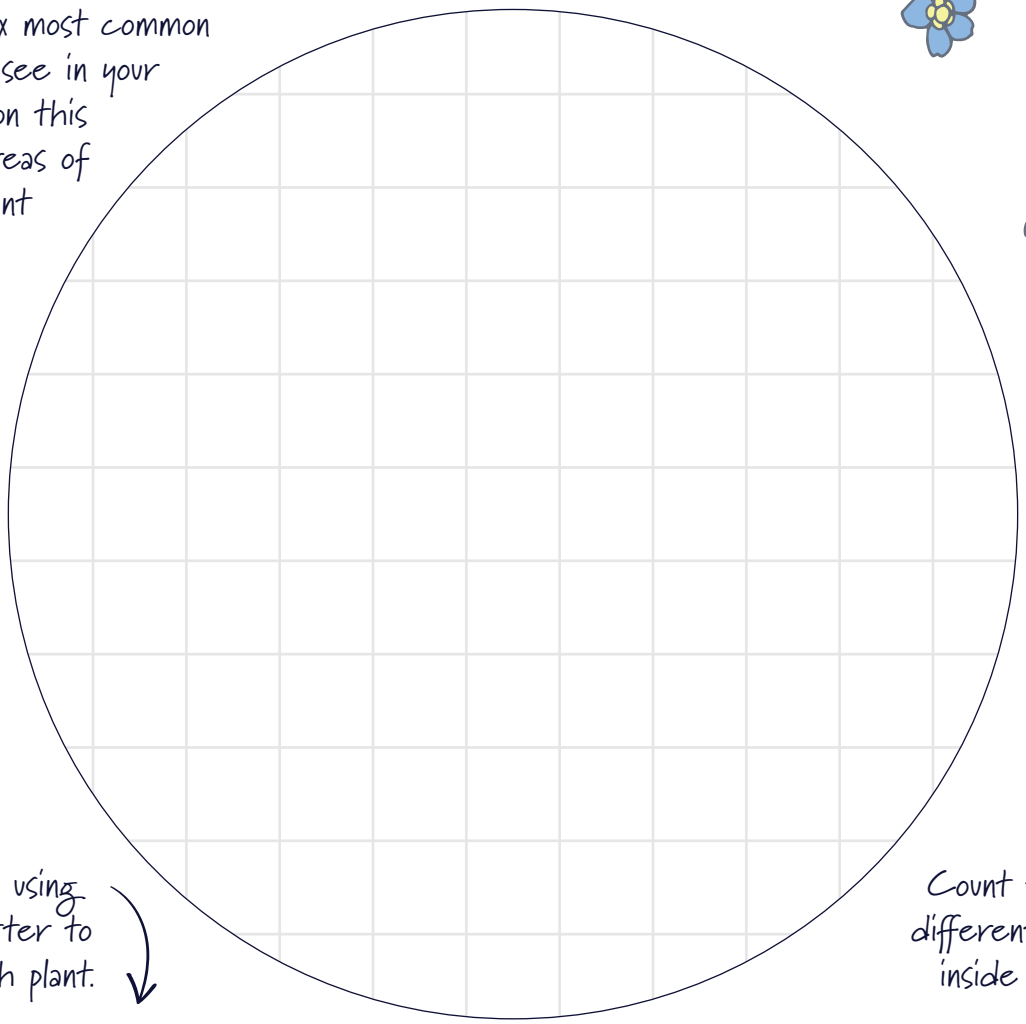
Add any plants you've found that aren't included on the first page

Species name	Drawing or Description	Number found	UK Native or Introduced

Hula Hoop Survey

Name/Team name:	Describe the habitat:
Date:	Season:
Season:	

Choose the six most common plants you can see in your square. Draw on this picture the areas of space each plant takes up.



Create a key using a colour or letter to represent each plant.

Count the number of different plant species inside your hula hoop.

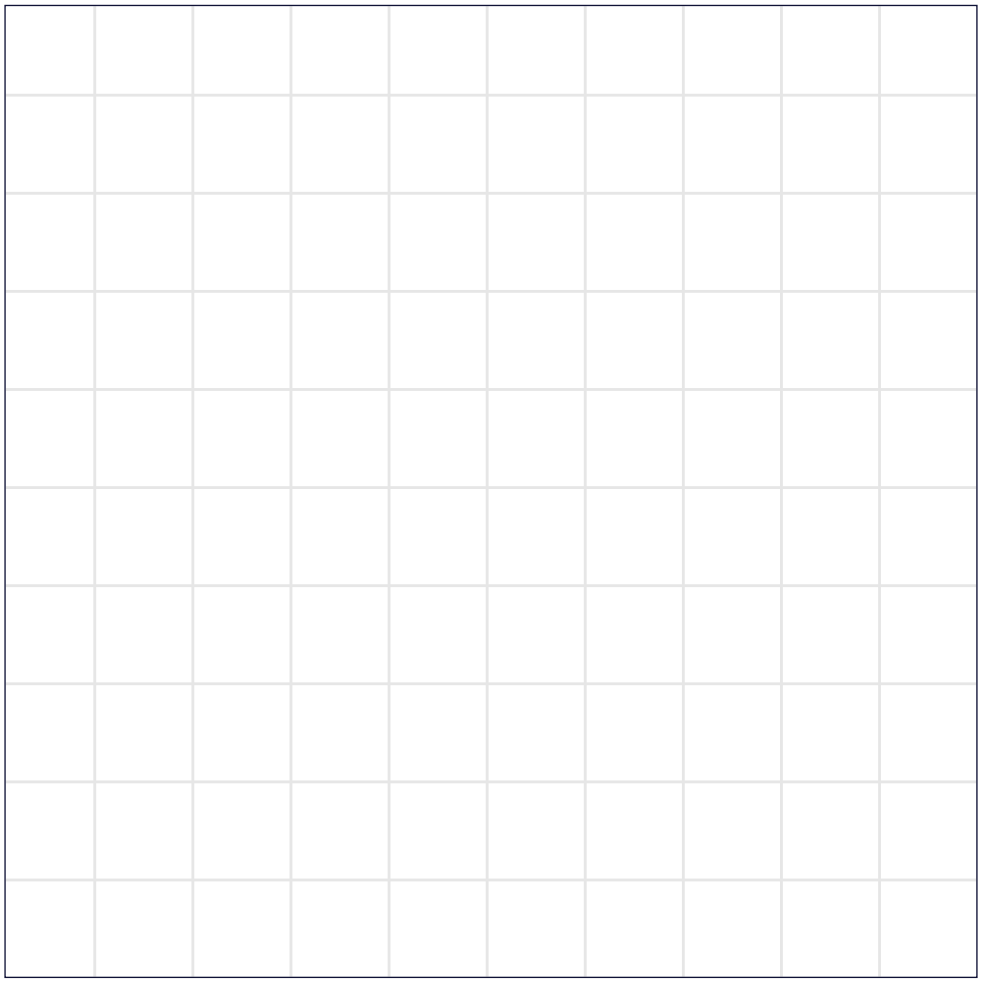
Plant Key: Most common species

Colour	Plant name	Colour	Plant name	Total number of species
☐	.....	☐	.....	
☐	.....	☐	.....	
☐	.....	☐	.....	

Hula Hoop Survey

Name/Team name:	Describe the habitat:
Date: / Season:	

Choose the six most common plants you can see in your square. Draw on this picture the areas of space each plant takes up.



Create a key using a colour or letter to represent each plant.

Count the number of different plant species inside your hula hoop.

Plant Key: Most common species

Colour	Plant name	Colour	Plant name	Total number of species
☐	.....	☐	.....	
☐	.....	☐	.....	
☐	.....	☐	.....	

Species Spotlight: Plants

Species Name

.....

Scientific Name

Picture

Type of Plant

UK Native ☐ Invasive ☐

Introduced ☐ Not a threat ☐

History

Habitat

Identification Tips

Interesting Facts

Invasive Non-Native Species

Answer these questions if your plant is an introduced species.

Species Name

How does this plant out compete native plants?

What impacts does it have on riverbank biodiversity?

What can be done to control this species?

Native Species

Answer these questions if your plant is a native species.

Species Name

How does this plant help other plants and animals?

Why is this plant important for biodiversity?

What can be done to protect this species?

Super Spreaders

Lesson Plan

Riverbank Biodiversity

Learning Objectives

- Understand why seed dispersal is an important part of a flowering plant's life cycle.
- Explore different seeds and explain how they are spread.
- Learn the difference between native and non-native, invasive species and how they differ.
- Investigate how a 'super spreader' like Himalayan balsam might impact local biodiversity.

Equipment & Resources

- Pencils, buckets/bags (enough for 1 between 2 or 3), Seed scavenger hunt, Himalayan Balsam Species Spotlight resource, recycled materials for seed launcher craft

Vocabulary

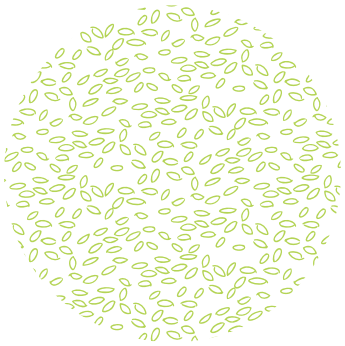
Seed dispersal, flowering plant, life cycle, adaptation, invasive, native, biodiversity.

Ideal for Autumn

Introduction

Super Spreaders Worksheet: (30m)

Talk to your group about the role of a seed in the life cycle of a plant, ask them how they are made, why they are important and what they need to survive and grow. Then ask your learners if all seeds look the same, and if not, why not? Each plant has adapted its own way of spreading its seeds away from the parent plant in a way that suits the plant and works with the ecosystem it thrives in. Ask your learners to work through the **Super Spreader worksheet (p.42)**. This covers some of the different types of seed dispersal and describes the characteristics these seeds have that make them suited to their method of dispersal.



Activities

Seed Collection Walk: (30-45m)

Head out to your local riverbank spot, woodland, or other chosen green space to explore and collect as many types of seeds as you can using buckets or bags. You can use our **Seed Scavenger Hunt (p.38-39)** resource to help guide your learners while exploring.

You'll find different types of seeds near the base of certain types of trees (dispersed by gravity) and on the woodland floor. Some seeds may still be attached to the parent plant. Pick a small selection of these, but mind any prickles. Remember to collect considerately, leaving enough seeds to be dispersed or eaten by the wildlife.

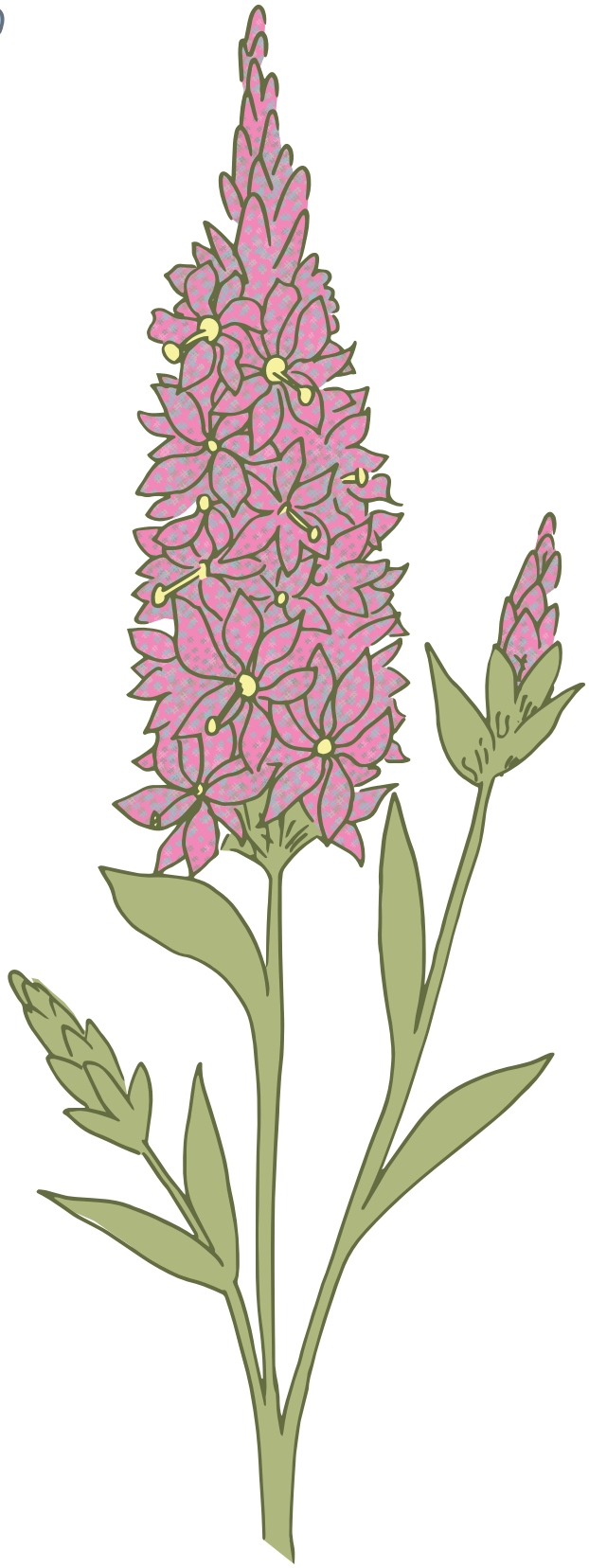
If you know you will find Himalayan balsam along your walk, prepare your learners in advance with the 'Super Spreader' activity on the next page.

Activities

Seed Sorting: (20m)
Ask your group to examine the shapes and textures of their seeds. Ask them to sort them based on the type of dispersal by comparing their characteristics with those listed on the worksheet. What type of dispersed seeds were easiest to find, and which were the hardest? Could any of these seeds have more than one way of being dispersed? To answer this question, your group could try creating a Venn diagram of wind and water seed dispersal examples.

Super Spreaders: (20 mins)
Many of the seeds that the group will have found so far will likely be from native plants and trees. This activity will introduce an example of an 'Invasive Non-Native' plant, introduced to the UK through human activity. Share a copy of the **Himalayan balsam Species Spotlight (p.18-19)** resource between pairs of learners and ask them to read it through and to answer the questions on the **Species Spotlight Worksheet (p.31)**. Alternatively, use the questions as a basis for a class discussion.

Seed Launcher Craft:
(15m to design, 45m to create)
Learners will apply their knowledge of seed characteristics and dispersal methods to design and create their own working model of a seed or a seed pod. See the **Seed Launcher Activity (p.36)** for instructions.



Seed Launchers

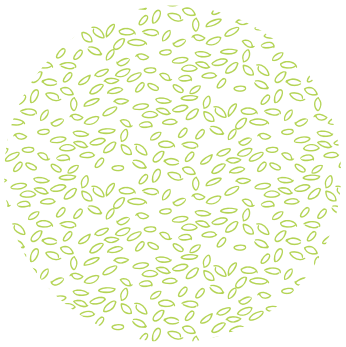
Activity Instructions

Description

Learners will get creative using recycled materials to design their own model seed pods. They can explore different dispersal methods and test whose seeds travel the furthest/ which team can launch their seeds the furthest.

What You'll Need

A range of recycled or unused materials for the group to experiment with. For example:



- Empty drinks bottles
- Paper
- Paper clips
- Pompoms or cotton balls
- Cardboard tubes/cups
- Balloons/elastic bands
- Scissors
- String/tape/glue
- Velcro/felt pieces

You will also need a measuring tape or metre stick to measure the distance the seeds have travelled.

Instructions

Design: 15m | Make: 30m | Test: 15m

- **Introduce the activity:** Review the different types of seed dispersal (wind, water, animals, and force) and discuss how seeds are adapted to travel in these ways.
- **Set up teams:** Divide the class into small groups. Explain their challenge is to design and build a seed model that can travel as far as possible from a set 'parent plant' spot. Teams can either choose a dispersal method to represent or have one assigned.
- **Provide materials:** Give each team a range of recycled materials to experiment with as they design their seed model. Encourage creativity while thinking about the dispersal method they are demonstrating.
- **Test and measure:** Mark a starting spot in the classroom to represent the parent plant. Each group presents their seed model, explaining how it works and what type of habitat it would suit best. One team member demonstrates the seed dispersal, and the class measures how far it travels. Repeat 2 more times to get an average for each team.
- **Class discussion:** Ask the rest of the class to identify which dispersal method each model represents. Discuss how adaptations helped the seed travel and compare the effectiveness of each method.

Seed Dispersal: Riverbank

Seed Dispersal Method: Key

Animal Water Wind Force

Summer

How many different types of seeds can you find?

Himalayan Balsam (seed pods)

Willow

American Skunk Cabbage

Gorse (seed pods)

Poppy (seed pods)

Alder tree (seeds inside cones)

Dandelion

Thistle

Yellow Flag Iris

Willowherb

Piri Piri Burr

Burdock

Image: Tweed Forum

Seed Dispersal: Woodland

Seed Dispersal Method: Key

Animal Gravity Wind Force

Autumn

How many different types of seeds can you find?

Hazel

Beech

Wild Strawberry

Elder

Hawthorn

Oak

Sycamore

Ash

Birch

Bluebell

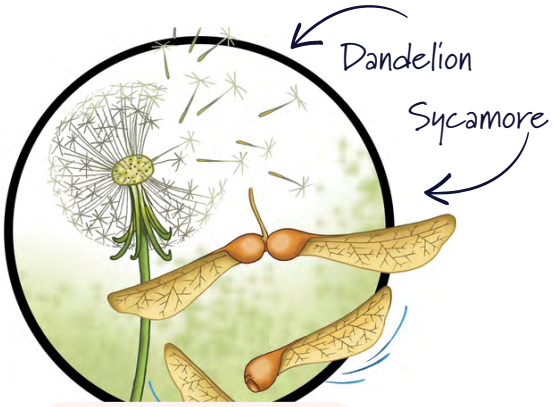
Scots pine

Horse Chestnut

Super Spreaders

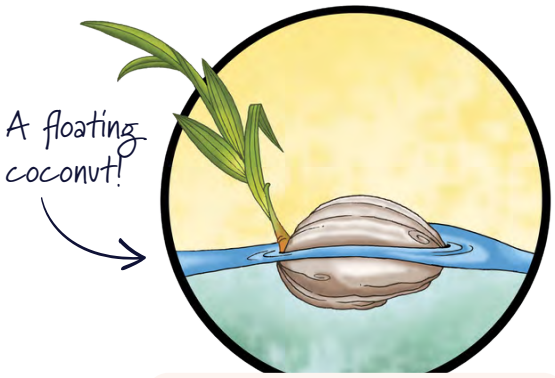
An important stage in the life cycle of a flowering plant is the dispersal of its seeds. Moving the seeds away from the parent plant will reduce competition for space, light and nutrients and increase the chances that the seed will grow into a healthy plant. In the pictures below, you can see some of the ways that plants have adapted to spread their seeds.

Wind



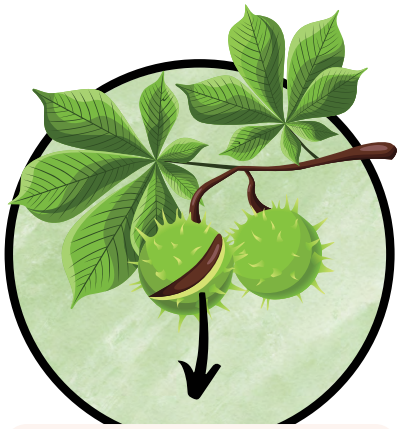
- Lightweight
- Fluffy
- Have wings
- Can glide or drift in the air

Water



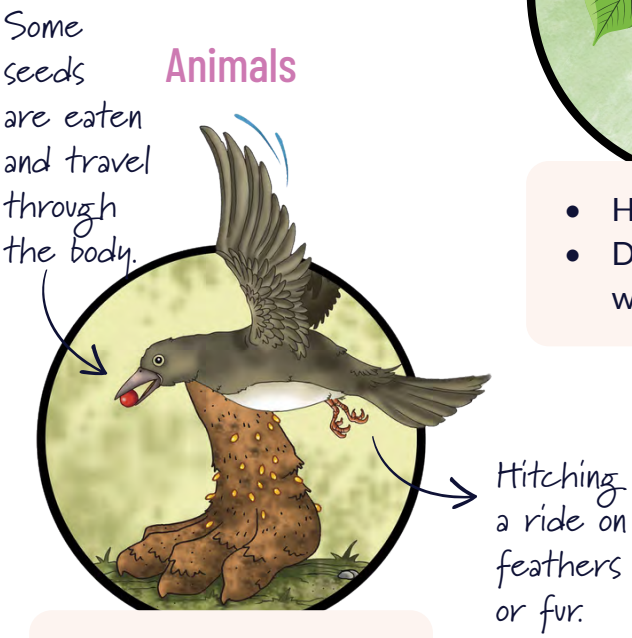
- Waterproof
- Light
- Have pockets of air to help the seed float

Gravity



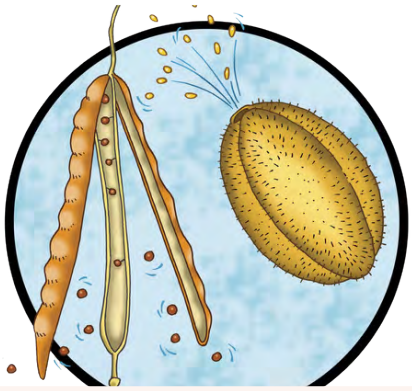
- Heavy
- Drop to the ground when they are ripe

Animals



- Have hooks or burs
- Are edible and tasty
- Can be buried and eaten later

Force



- Force
- Seeds stored within pods
- Pods burst open and scatter the seeds


Image: Tweed Forum

Super Spreaders

Can you identify how each of these plants spreads its seeds, and explain what clues helped you to decide?

Rosebay willowherb

Type of seed dispersal:
Clues:

Alder

Type of seed dispersal:
Clues:

Greater burdock

Type of seed dispersal:
Clues:

Bird's-foot trefoil

Type of seed dispersal:
Clues:

Hint: *Read the seed descriptions on page one to help you work out the answers.*

Super Spreaders

Answer Sheet

Can you identify how each of these plants spreads its seeds, and explain what clues helped you to decide?

Rosebay willowherb

Type of seed dispersal: Wind
Clues: The seeds are fluffy and lightweight, ready to catch the breeze and be carried away.

Alder

Type of seed dispersal: Water
Clues: Lightweight cones with pockets of air that will help the seeds float.

Greater burdock

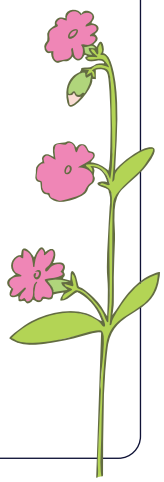
Type of seed dispersal: Animal
Clues: The seed is covered in small hooks, ready to grab onto the fur of passing animals.

Bird's-foot trefoil

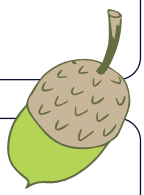
Type of seed dispersal: Force
Clues: The long seed pod is drying out, ready to burst open and scatter the seeds.

Super Spreaders

Plants can now spread their seeds further than ever before with the help of humans. Can you describe some of the ways this might happen, either accidentally or on purpose?



What do you think could be the advantages or disadvantages of seed dispersal through human activity?



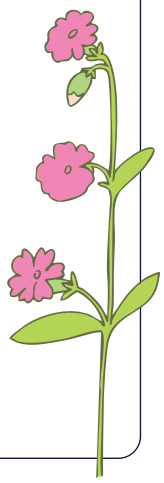
How can we help to stop the spread of seeds from invasive plants that can damage our natural habitats?

Hint: Think about the ways that humans can spread seeds.
What type of actions could stop this from happening?

Super Spreaders

Answer Sheet

Plants can now spread their seeds further than ever before with the help of humans. Can you describe some of the ways this might happen, either accidentally or on purpose?

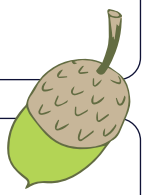


Answer:
Seeds can attach to our clothes and shoes, disposing of fruit with pips or stones, farming, and gardening.

What do you think could be the advantages or disadvantages of seed dispersal through human activity?

Answer:
Advantages: Humans can grow food for people and animals, growing flowers and plants in gardens, planting meadow habitats, and planting flowers that can be food for pollinators.

Disadvantages: Spreading non-native plants that can threaten biodiversity, and spreading weeds where they are not wanted.



How can we help to stop the spread of seeds from invasive plants that can damage our natural habitats?

Answer:
- Make sure to clean your wellies after a splash in the river.
- Clean any equipment that you have used in the river (nets, oars, fishing rods, etc).
- Clean mud off your bike or shoes.
- Report sightings of Invasive non-native plants to Tweed Forum.
- Brush your dog down after walks to help keep its fur free of seeds.

Seed Launcher Model Challenge

Working as a team, your challenge is to design and make a model that demonstrates a method of seed dispersal using some of the materials provided. Your model should be able to move as far away as it can from its original spot (representing the parent plant).

Group name:

Design ideas:

Type of seed dispersal:

Characteristics:

Image: Pixabay

Riverbank Plants: Glossary

Organism	Any living thing.
Ecosystem	An environment where living and non-living things interact. E.g. plants & animals interact with weather & soil.
Native species	A plant that is found naturally in a given area or habitat.
Invasive species	A non-native plant that harms its new environment.
Flowering plant	A plant that produces flowers as part of its life cycle.
Adaptation	How a species changes to better suit its environment.
Climate change	The long term shifts in Earth's temperatures and weather patterns.

You can use this page for reference or print & cut out the rectangles for a plenary game of mix and match.

Species	A group of organisms that share the same characteristics and can produce offspring.
Biodiversity	The variety of living things in an environment.
Non-native species	A species that has been introduced to an area or habitat by humans.
Riparian	The area of land along the side of a river and anything related to this area. E.g. riparian plants.
Seed dispersal	How a plant transports its seeds to a new area.
Sampling	Collecting information from a small area to help learn more about a larger area.
Global warming	The increase in Earth's temperature caused by greenhouse gases like carbon dioxide.

Curriculum Links

Curriculum for Excellence

CfE Experiences & Outcomes	Hula Hoop Plant Survey	Super Spreaders
SCN 2-01a: Classify living things and explain adaptations.	X	X
SCN 2-02b: Benefits of plants to society.	X	
SCN 2-14a: Life cycles of plants and animals		X
SCN 2-20b: Current scientific news		X
HWB 2-23a: Working with others	X	X
MNU 2-20b: Carrying out surveys using a variety of methods	X	
MTH 2-21a: Display data using tables, charts and graphs	X	
TCH 2-10a: Using design skills to solve problems and make models		X
EXA 2-05a: Express thoughts and feelings through art/design	X	

National Curriculum

KS2	Hula Hoop Plant Survey	Super Spreaders
SCIENCE		
Yr. 3: Role of flowers in plant life cycle		X
Yr. 4: Recognise things can be grouped in a variety of ways	X	X
Yr. 4: Identify and classify living things	X	X
Yr. 4: Potential threats of changing environments	X	X
Yr. 5: Describe life process of reproduction in plants		X
Yr. 6: Describe grouping living things by characteristics	X	X
Yr. 6: Explain reasons for classifying plants/animals	X	X
Yr. 6: Identify plant and animal adaptations		X
MATHEMATICS		
Yr. 3: Interpret and present data (bar charts, pictograms,	X	
Yr. 6: Interpret and construct pie charts and line graphs	X	

Sustainable Development Goals (SDG)

Hula Hoop Plant Survey: This lesson supports **SDG 15** by promoting biodiversity and fostering a sense of environmental stewardship for learners. Through investigating riverbank plants, pupils learn about local species and understand the impact of invasive non-native plants.

Super Spreader: This lesson supports **SDG 15** by exploring how seed dispersal affects ecosystems and why protecting native species is important. Learners will also discover how invasive 'super spreader' plants like Himalayan balsam can threaten local biodiversity.

Project Delivery Partners

Project Funders

Co-funded by the European Union

Tweed Forum: At the heart of land and water management on Tweed.

Destination Tweed: Destination Tweed is a unique project which aims to celebrate and share the nature, history and stories of the River Tweed and deliver significant economic, environmental, educational and social benefits to the South of Scotland and North Northumberland.

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

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