EXPLORING OUR WILD ISLES:

FRESHWATER

ACTIVITY GUIDE FOR SECONDARY TEACHERS AND YOUTH GROUP LEADERS

AGE 11 – 16 YEAR OLDS

SAVE OUR WILD ISLES

WWF | RSPB | National Trust

© ScotlandBigPicture.com/WWF-UK

© Martin Harvey/WWF

© Pixabay

© David Bebber/ WWF-UK

INTRODUCTION

Have you ever taken the time to think about all the amazing landscapes we have in the UK?

Despite being small, the combination of weather, climate and ancient rock formations we have in the UK means that we are lucky enough to have some of the most diverse and beautiful landscapes on Earth. From our high craggy mountains, boggy moorlands, rushing rivers, dense green forests, tranquil lakes, wildflower meadows, rocky coastlines and wild seas, each of these unique landscapes is packed full of different habitats with a huge variety of plants, animals and fungi.

Because of this, the UK is home to some amazing natural wonders: spectacular murmurations of starlings, beautiful woodlands sprinkled with bluebells, rutting deer on frosty mornings, glittering blue damselflies dancing over streams, damp forest floors exploding with mushrooms – it's all here, right on our doorstep!

But despite all of this, we have not been protecting our precious nature. We have farmed intensively across almost all our land, we have expanded towns and cities putting pressure on surrounding countryside habitats, built miles of roads and trainlines carving up wild habitats, and polluted our waters with plastics and pesticides.

The UK is now one of the most nature depleted countries in the world and many of our unique habitats are under pressure. Over the last 50 years we've seen huge declines in populations of native species. More than one in seven native species are now facing extinction and more than 40% are in decline, including some of our most iconic species like bumblebees and hedgehogs.

GETTING TO KNOW FRESHWATER

Freshwater habitats like rivers, streams, ponds and marshes need to be protected. They are home to thousands of species in the UK including dragonflies, salmon, frogs, newts, kingfishers, herons, dippers, otters and water voles. They allow wildlife to travel vast distances through different kinds of landscape to complete their life cycles, and act as conveyor belts transporting nutrients and sediment.

And it's not just wildlife that needs freshwater - we drink freshwater to stay alive, use it to keep clean, to water the crops we depend upon, to generate energy and in the manufacture all sorts of products. Rivers act as transport routes, they provide fish to feed people and their floodplains provide important flood protection... in other words, we couldn't manage without them!

Unfortunately, human activities are putting our freshwater habitats under tremendous strain. Thirsty crops suck up water, industrial pollution and sewage leaks into rivers, natural habitats are built over, and dams and weirs divide up our river systems. Too often, our rivers and wetlands are seen as pipes for water and a way of disposing of waste rather than rich environments providing diverse benefits for people and nature. Wildlife populations are shrinking faster in freshwater ecosystems than in any other type of habitat on our planet, and this means that many of the things we need from rivers, lakes and wetlands are also in danger of being lost.

But we can bring our freshwater habitats back to life. Reedbeds are now being restored across the UK, helping to save bitterns from the brink of extinction in the UK. We once lost beavers from the UK altogether, but now they're back, building dams and reshaping whole freshwater systems – helping plants, insects, fish and birds to thrive. We're saving over-modified rivers, such as Swindale beck, by letting nature take the lead.

As the UK experiences more droughts and floods, our freshwater habitats will be an ever-important lifeline. We need to uphold regulations that protect our rivers, to improve the quality of our water and ensure we can adapt to a changing climate.

If we all work together, we can bring the blue veins of our wild isles back to life.

Freshwater facts

- Only 2.5% of the water on Earth is freshwater and most of that is locked up in ice caps and glaciers.
- Rivers, lakes and freshwater wetlands cover around 1% of the Earth's surface, but they're home to almost approximately one third of the world's vertebrate species.
- Over half of all known fish species live in freshwater.
- Almost 90% of the world's wetlands have been lost since 1700.
- We have over 11,000 rivers and 40,000 lakes in the UK.

WHAT'S IN THIS GUIDE

This guide is designed to be used by teachers and youth group leaders and contains activities suitable for young people aged 11-16 (Key Stage 3-4, Third-Fourth Level). These activities are all designed to encourage students to connect with UK nature, explore the biodiversity of their local green spaces and learn more about freshwater ecosystems. We recommend using the Save Our Wild Isles presentation in combination with these activities.

Activity 1:
Ecosystem engineers

Activity 2:
Beaver debate

Activity 3:
Freshwater food webs

Activity 4:
Make a mini pond

Activity 5:
Nature-friendly careers

Sustainable development goals

The activities in this guide link to the following Sustainable Development Goals:

Ensure availability and sustainable management of water and sanitation for all.

- 6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
- 6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
- 6.6 By 2030, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

ACTIVITY 1
ECOSYSTEM ENGINEERS

Time: 1 hour

This activity can get quite messy and wet so works best outside!

Curriculum links: England: Biology, Geography; Scotland: Sciences, Social studies; Wales: Science and technology, Humanities Northern Ireland: Geography, Science.

Beavers are nature's architects. They fell trees with their impressive front teeth and build dams across rivers and streams using branches, mud and weeds. Through this activity students will become ecosystem engineers by constructing their own beaver dams, observing the impact this has on the flow of water in a river, and considering how this might benefit humans and wildlife.

You will need

- Plastic tray or tub to act as the river (recommend at least 40cm in length).
- 200ml of water.
- Measuring flask or cylinder.
- Natural materials to build dam – sticks, rocks, leaves, cardboard, paper scraps etc.
- Modelling clay or playdough.
- Stopwatch.
- Small people or house figures (optional).

Instructions

1. Discuss with the class how beavers are keystone species, animals that have a huge impact on the environment they live in. *Why are beavers keystone species? What materials do they use to build dams? What effect would building a dam have on the speed of water and any impacts on the wider ecosystem?*
2. In groups of 4, get students to set up their plastic trays with a very slight slope - this will be the river.
3. Students can first pour 100ml of water (carefully but quickly) at the top of the tray to demonstrate how the river flows without a dam. Using a stopwatch students should time how long it takes for all the water to reach the lower side of the tray – this can be their control.
4. Students should choose two materials from the options given and start building their beaver dams across the width of the tray (just like how beavers work in the wild). If needed, prompt them to think about how they might use the different materials, whether they could use something to help secure the dam to the base of the tray, or whether a certain material might hold the dam together more (clay or playdough to act like mud!).
5. Give students 5 minutes to build their dams. Once completed, students can measure the height and depth of their dam, and add any houses or people figures downstream to represent villages and towns.
6. Once the river is all set up, one student should carefully pour water into the upstream section of the river, and at the same time, one student should use the stopwatch to time how long it takes for all the water to reach the lower side of the tray.
7. Draw a table on the board with different columns for each student group, and rows for the height, depth, materials used, speed of water without dam, and speed of water with dam. Students can add in their results to the table so that you get a full set of results for the class.
8. Use the class results to discuss which materials made the best dam (i.e. held back water for the longest time). Did any team have any good tactics for building their dam? What other improvements could they make to enable their dams to hold back even more water? What would happen if they made their dams completely impermeable?
9. Next discuss how the students think beaver dams could impact rivers and other surrounding environments. How might beavers and their dams be able to help with environmental issues like pollution, nature loss and climate change? Why might natural solutions be better than human made dams?
10. As a follow on, try the beaver debate activity on page 6.

ACTIVITY 2
BEAVER DEBATE

Time: 40 minutes

Curriculum links: England: Biology, Geography; Scotland: Sciences, Social studies; Wales: Science and technology, Humanities; Northern Ireland: Geography, Science.

Cross curricular links: England: English, Citizenship; Scotland: Literacy and English; Wales: Languages, Literacy and Communication; Northern Ireland: Language and Literacy.

Beavers used to be widespread across the UK, but they were hunted to extinction over 300 years ago mainly for their fur, meat and 'castoreum', a sweet-smelling secretion used in perfumes, food and medicine. Small numbers of beavers have recently been reintroduced to parts of England, Wales and Scotland. This activity asks your students to debate whether beavers should be reintroduced to the fictional town of Greenville, encouraging them to think about the viewpoints of different stakeholders and to consider the pros and cons of beaver reintroduction programmes in the UK.

Case study

Greenville is a small town built around the picturesque River Dipper. Greenville gets quite a few tourists due to its beautiful surrounding landscapes and local walking trails. However, the area is prone to flooding which can cause building damage and problems with local infrastructure. Greenville is surrounded by lots of farms growing crops and raising animals. Local farmers often sell their quality produce at the Greenville farmers' market on a weekend. Greenville Council has recently heard that the River Dipper might be considered for a future beaver reintroduction programme. The Council are holding a town meeting to decide whether they should reintroduce beavers into the area...

1. Read the case study aloud to the class and prompt students to think about who might be affected by the reintroduction of beavers in Greenville. Explain that stakeholders are people or groups that are positively or negatively impacted by a project, initiative, policy or organisation.
2. Organise the class into groups of 9-12 and give out one of the stakeholder cards to each group member.
3. Give the groups 10 minutes to read through their cards and discuss their different stakeholder viewpoints. Prompting questions for students to think about could include:
    - How will my stakeholder be affected?
    - What is the main motivation for my stakeholder's argument?
    - What does my stakeholder stand to lose or gain from the reintroduction of beavers?
    - How will the reintroduction of beavers affect: local livelihoods, wildlife, the landscape, quality of life, future risks?
4. Give groups another 5 minutes to decide whether they would be in favour or against the beaver reintroduction to Greenville. Can they come up with any solutions to help ease tensions between different stakeholders?
5. Ask each group to present their viewpoint to the class. Did the other groups come to the same conclusions?
6. Conclude with a class vote or discussion about the best way forward for Greenville.

SAVE OUR WILD ISLES

Potato farmer

"I am very concerned about introducing beavers and the impact it will have on my livelihood here in Greenville. I've heard lots of stories about beaver dams causing areas of profitable farmland upstream of the dam to flood - that's exactly where my farm is! I cannot afford to lose valuable potato crops from flooded land!"

Flooding management officer

"I am undecided about the beavers – on the one hand we know that beavers can burrow through flood defences, and their dams can cause flooding on roads, farms and railways which costs us a lot of money to repair. But on the other hand, beaver dams and ponds can increase the water storage capacity of a wetland area, which could reduce the flood risk to Greenville and save us millions in flood damage costs."

Soil scientist

"Our wetland habitats are really good at drawing down carbon from the atmosphere and storing it. But, over the past 50 years we've lost vast areas of wetland due to intensive farming practices, development on floodplains and pollution. If we introduce beavers to Greenville, this could help us to restore our important wetland habitats, and help to draw down more carbon from the atmosphere into the soil."

Cattle farmer

"My cattle farm is downstream of where the beavers could be introduced. The dams and ponds that the beavers build, could help to provide a consistent water supply for my pasture fields throughout the year, even in times of severe drought. That means I could get enough water to grow lush grass to feed my cattle, and I could also use the ponds to provide drinking water for my livestock, which could save me money."

Angler

"I am a very keen angler and find that fishing improves my mental and physical health, helping me get out into nature. If beavers are introduced to the River Dipper, I won't be able to fish there anymore as the site will have to be protected. The River Dipper has a long history of being great for fishing so I would hate to see this end. I also enjoy using the woodlands around Greenville for camping with my family. My local campsite is right near the potential beaver relocation site and if the beavers started felling trees there, it would become dangerous for visitors and the campsite would have to close."

Local hotel owner

"I like the idea of introducing beavers into the River Dipper because I think they could be great for tourism. Lots of people from across the UK will want to see the beavers, and visitors will bring in more money to our local shops, cafes, pubs and hotels. I could even put on trips with our local wildlife guide for my guests! I also think that extra flood protection for our town is very important. Last year's winter flooding caused damage to a few rooms in my hotel, which cost me a lot of money to repair and lost me two weeks of business."

SAVE OUR WILD ISLES

Local wildlife guide

"I am 50 and have lived in Greenville all my life. Over my lifetime I have noticed a huge decline in wildlife around our beautiful town and countryside – I haven't seen a water vole in over 10 years! I am in support of the beaver introductions because I know that beavers can create new habitats and help restore wetland areas. This would help to provide new homes for dragonflies, amphibians, birds, fish, and mammals like water voles and maybe even otters. Beavers also fell trees near riverbanks to make their dams which provides space for young tree saplings to grow, encouraging more species of beetle and other invertebrates."

Beaver relocation officer

"It is true that beavers can dramatically change landscapes, and this can be damaging to areas of farmland. However, I work for an organisation that can work with farmers to relocate problematic beavers to places where they will benefit nature and the environment, and away from areas where they might cause harm to agricultural land."

Local resident

"I am very sceptical about the beavers. They went extinct in the UK over 300 years ago and our landscapes have changed a lot since then. How do we know the impact the beavers are going to have on our town and our local farms? I also love our local rowan, hazel and willow trees and know that beavers will fell these to get wood for their dams – shouldn't we be protecting our precious local trees?"

Wildlife charity communications manager

"A big part of my job is using social media to communicate the importance of climate change and nature loss to the public. I think a new beaver reintroduction programme in Greenville, could really help me reach a bigger audience in this area and get people interested in climate change and nature. Beavers are furry, charismatic creatures with a wide public appeal. I think their biodiversity benefits and ability to help us tackle flooding, will help people to understand how we can use nature-based solutions to tackle climate change, and encourage people to make positive changes for the planet."

River quality officer

"I know that beaver dams can help improve water quality, but I think it would be irresponsible to reintroduce more beavers into the River Dipper right now. I've recently tested the river and it contains a lot of chemicals from pesticides and fertilisers, and I found quite a few bits of plastic collecting on the banks. In fact, at the moment only 35% of the UK's water bodies are in good ecological condition. We shouldn't introduce beavers into river habitats without first making sure they are in good ecological condition."

Climate change scientist

"In the UK, flooding and droughts are of increasing concern and beavers are a cheap nature-based solution!

By building dams across streams, and creating lots of new ponds and channels, beavers can help slow down the flow of the river. This means that during high rainfall, the land is more able to hold the water back, and less likely to cause severe floods downstream. Beaver dams also ensure a more constant flow of water during dry periods, so will help to prevent the area from drying out during a drought."

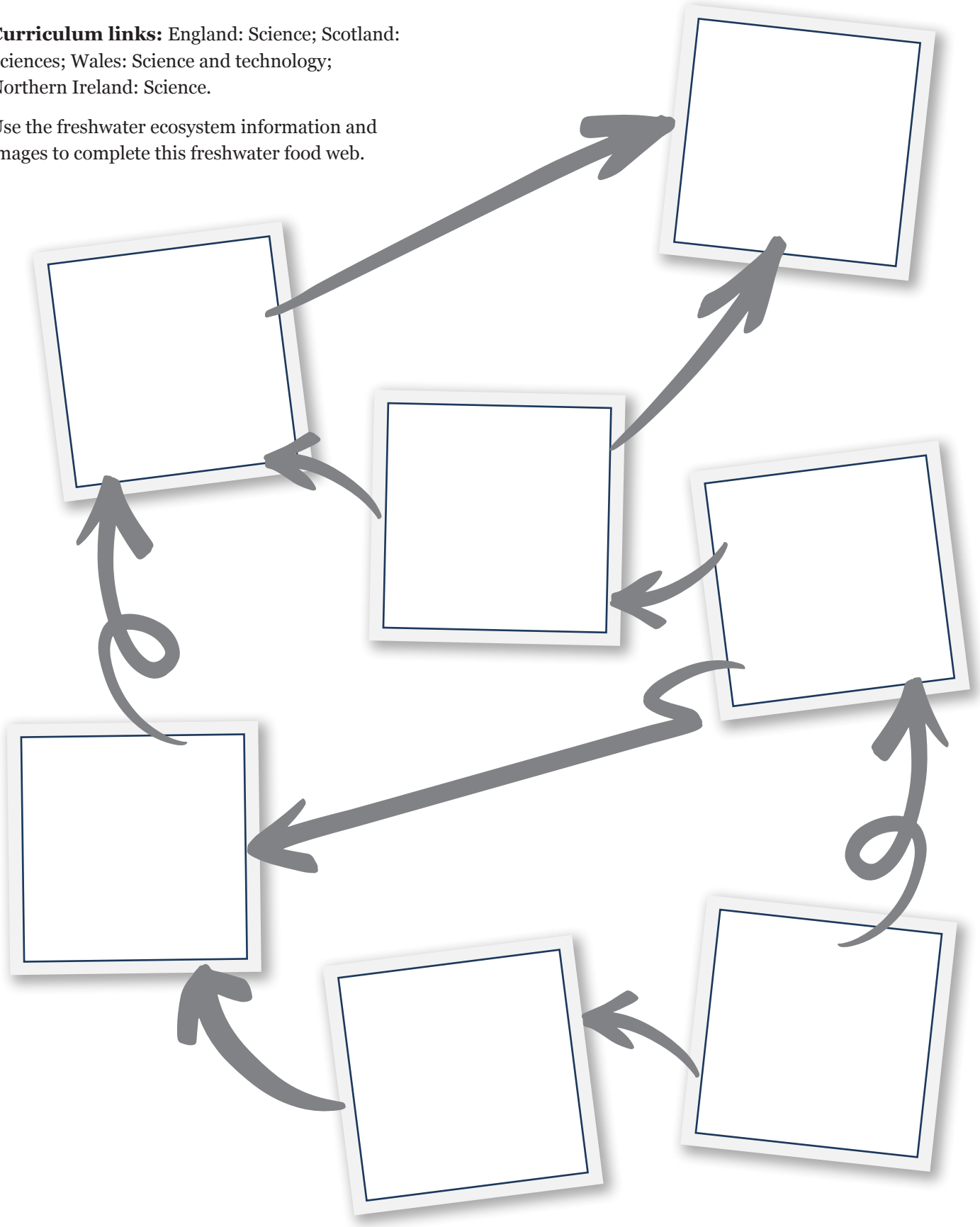
ACTIVITY 3
FRESHWATER FOOD WEBS

SAVE OUR WILD ISLES

Time: 20 minutes

Curriculum links: England: Science; Scotland: Sciences; Wales: Science and technology; Northern Ireland: Science.

Use the freshwater ecosystem information and images to complete this freshwater food web.



ACTIVITY 3 - CONTINUED

SAVE OUR WILD ISLES

Common frog

Amphibian

Eats insects and molluscs

Water flea

Crustacean

Eats pond algae and organic detritus

Grey heron

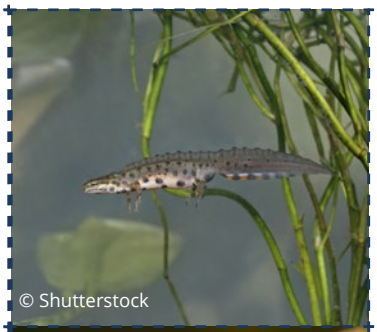
Bird

Eats frogs, fish and newts

Pond algae

Algae

Produces energy through photosynthesis



Smooth newt

Amphibian

Eats small crustaceans and insects

Lesser water boatman

Insect

Eats pond plants and algae

Stickleback

Fish

Eats frogs and newts

ACTIVITY 3 - CONTINUED

SAVE OUR WILD ISLES

What do the arrows on the food web represent?

What is the definition of a producer?

Label the consumers and producers in the food web. Which animal is the top predator for this food web?

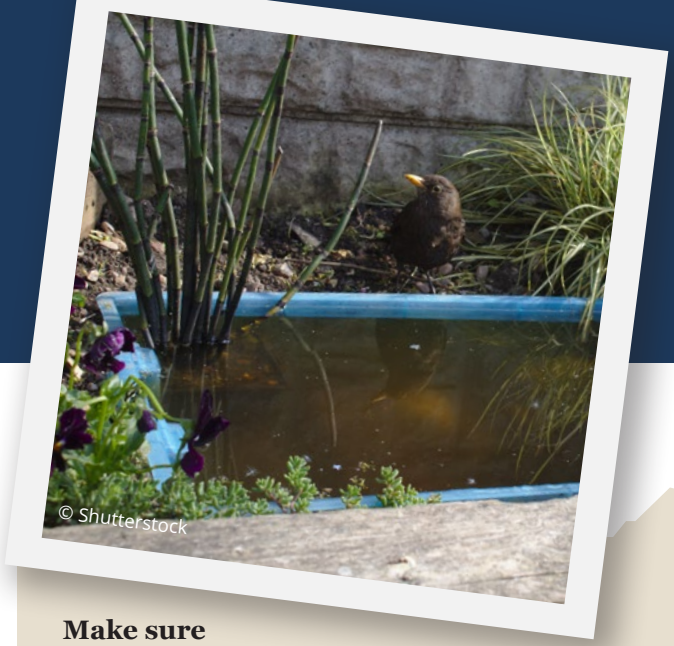
The population of newts has had an outbreak of disease. Name one other species that may face a decrease in population because of this and explain why.

Name one species that may increase in its population size and explain why.

A nearby farm uses pesticides to discourage pests from eating crops. How can pesticides cause problems for predators like the heron?

ACTIVITY 4
MAKE A MINI POND

Time: 30 minutes



Make sure you have permission to add mini ponds around your school grounds!

Curriculum links: England: Science, Geography; Scotland: Sciences, Social studies; Wales: Science and technology, Humanities; Northern Ireland: Geography, Science.

Building a pond is one of the best things you can do to improve local biodiversity and it's really easy! Follow these instructions with your students to create fantastic freshwater oases around your school. You could choose to make one larger pond as a whole class or a few smaller ones in groups.

You will need

- Large containers such as washing up bowls, plastic tubs, old plant pots – anything will do as long as it can be made watertight.
- Rainwater or tap water left for a few days.
- Gravel to line base of pond.
- Bricks, large stones or sticks.
- Pond plants – can purchase from a local garden centre or from a local pond with permission (optional).
- Small trowel or spade for digging pond hole (optional).

Instructions

1. Decide as a class where you want to position your mini pond(s) whilst the container is still easy to carry – it's good to try and find spots that get some sunlight and some shade at different parts of the day. It's also good to try and keep ponds away from trees otherwise they might fill up with leaves.
2. Students should place their container in the desired location. If they are digging it into the ground, they will need to dig a hole slightly larger than the container (make sure you have permission first!). Students should place container in the hole and use the soil they have dug out to secure it and fill in any gaps around the sides. If not digging into the ground, students can add some brick or stone steps around the edge of the container to encourage more creatures into the pond habitat.
3. Students should add some gravel to cover the bottom of the container, this is called the 'substrate layer' and provides a habitat for lots of different freshwater creatures, like dragonfly larvae and water boatmen.
4. Now using the stones, bricks or sticks, students should create different levels in their container – different pond creatures will prefer different habitats so it's good to give them a choice, it will also help creatures to easily get in and out of your pond.
5. Fill the pond with rainwater. If you can't use rainwater, you can use tap water, but you need to leave it for 2-3 days before it's safe for wildlife (tap water has chemicals added to make it safe for us to drink but these are not necessarily good for wildlife).
6. Finally, students can add pond plants to their new freshwater habitat. Pond plants will help oxygen get into the water and provide habitats and food for freshwater wildlife. Try to go for native plants, and if collecting from a local pond (with permission!), ensure that you take only a little so as not to harm any wildlife living there.
7. Schedule time for students to regularly check up on their pond(s) to discover any new wildlife they have attracted to the school grounds. Use the Seek app or nature spotting guides to help with identification. Students could also come up with a name for the new freshwater habitat(s) and make a plaque from cardboard or recycled wood to let everyone know!

ACTIVITY 5 NATURE-FRIENDLY CAREERS

We can all do what we can to give nature a helping hand in our own homes, gardens and communities. However, we may be able to have a bigger impact on nature through the job we have after we finish education. We can aim to have a 'sustainable career', which means making choices about what we do that are good for the planet as well as good for us.

Industries and big organisations can have a much bigger impact – for good or bad – on a landscape than a single person, and we can make career choices that allow us to be a force for nature in our working lives.

1. Think, pair and share activity (5 mins)

- Consider the issues that are affecting freshwater and list the human activities that are causing problems for wildlife or helping it to thrive.
- What jobs can you think of that are linked to the problems or solutions?

Some ideas that can be introduced and discussed are listed below.

Examples: Water treatment engineer, bottled water or soft drink producer, fish farmer, farmer, river conservation officer, architect, city planner, politician, lawyer, chef, teacher.

2. Whole class discussion

(10 mins)

- Go round and hear from each pair, building up a list of the jobs that could influence the health of freshwater.
- Pick on one or two and discuss the ways they have impact, and what choices they can make about how they go about their job.

© Yoon S. Byun / WWF-US

3. Think, pair and share activity (5 mins)

- Ask each pair to select one or two of the jobs on the list (you may wish to allocate them to ensure the pairs do not all discuss the same).
- What choices do we think someone following this career could make that could ensure they are doing good for nature?

4. Whole class discussion

(10 mins)

Feedback from pairs.

See if the choices highlighted can be grouped at all.

Key points to emphasise:

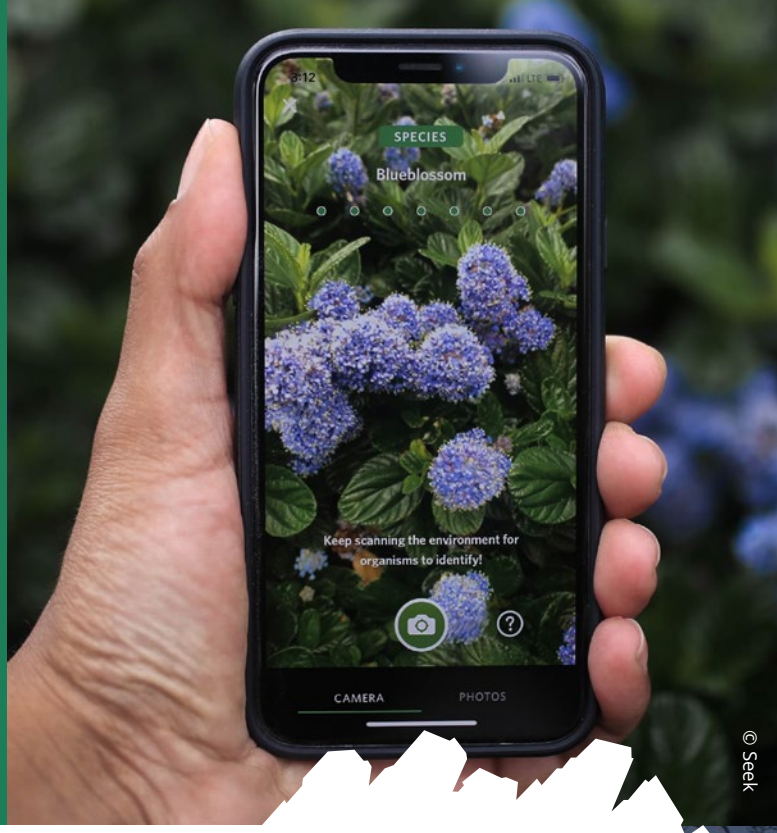
- Choosing to work for a company that is acting responsibly (making sure they understand their impact on nature and then seeking to minimise it).
- Changing a company while working for it by ensuring it prioritises nature and reduces impact.
- Innovating (finding new ways to do things or exploring new technologies to do a job without impact on nature).
- Doing good (e.g. conservation).

For more information and free resources on sustainable careers visit **www.sustainable-futures.org.uk**

seek by iNaturalist

SEEK APP

You can download the free Seek app by iNaturalist on a phone or tablet to unlock a whole world of freshwater nature on your doorstep! From newts and dragonflies to bullrushes and willow trees and everything in between, Seek's smart image recognition technology will identify what you've found and encourage you to discover the hidden natural treasures in your local surroundings.
www.wwf.org.uk/discover-nature-seek-app



© Seek

USEFUL LINKS AND RESOURCES

WWF

LearnToLoveNature freshwater activities
Learn to love nature - focus on freshwater | WWF

Rivers and freshwater explainer sheet
WWF_Rivers_Resource_A_Million_Hands.pdf

Our freshwater information sheet
primary_ourfreshwaters.pdf (panda.org)

@WWFUK_Education

RSPB

Schools' Wild Challenge Pond dipping activity (experience nature)
Pond dipping (rspb.org.uk)

Make a pond dipping net
make-a-pond-dipping-net.pdf (rspb.org.uk)

RSPB's Wild Challenge award
www.rspb.org.uk/schoolswildchallenge

@RSPB_Learning

© naturepl.com / David Tipling / 2020VISION / WWF

Working together to protect and restore UK nature.

WWF | RSPB | National Trust