



RIVERCRAFT

Managing flood risks and the environment in an urban river catchment (Preston, Lancashire, UK)

EDUCATOR GUIDE

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Game Overview & Main Learning Outcomes

These three games have been created by the Environment Agency with the following **learning outcomes**:

- Understand how different environmental challenges can affect people and the environment
- Learn about the complexities and challenges of environmental management
- Develop problem solving skills to tackle environmental challenges in a virtual world

More information on the Environment Agency can be found on the next page.

Game 1 – Managing Flood Risk

This game has been developed to help young people understand:

- Why flooding occurs
- How flooding can be reduced using flood defences including flood walls, glass panels and flood gates
- An example of a real-life flood risk management scheme on the River Ribble in Preston, England
- Various career roles available in the Environment Agency.

Game 2 – Climate Change And Flooding

This game has been developed to help young people understand how climate change can affect flooding, including:

- A disaster flooding scenario set 30 years in the future where the city of Preston has flooded
- Present-day tasks which reduce personal carbon use and can help to mitigate the effects of climate change: using solar power, sustainable meal choices, recycling waste and reducing water use.

Game 3 – Environment And Wellbeing

This game has been developed to help young people understand their local environment and the importance of biodiversity. Students can:

- Explore real-life parks (Avenham and Miller Parks by the River Ribble in Preston);
- Search for wildlife habitats and UK invasive species;
- Use in-game cameras and work-books to record their findings.

Places Of Interest

If you are local to Preston or interested in seeing the city, we have modelled key places of interest. These can be explored by taking the elevator in the Environment Agency building and there are local experts that you can click on to explore the city.

Who Is the Environment Agency (UK)?

A healthy and diverse environment enhances people's lives and contributes to economic growth. The Environment Agency in England work to protect and improve the environment. They help people and wildlife adapt to climate change and reduce its impact, including flooding, drought, sea level rise and coastal erosion. They improve the quality of our water, land and air by tackling pollution and work with businesses to help them comply with environmental regulations. They work as part of the Defra group (Department for Environment, Food and Rural Affairs), with the rest of government, local councils, businesses, civil society groups and local communities to create a better place for people and wildlife.

Are You Ready for This Challenge?

We know that climate change will lead to:

- hotter and drier summers
- warmer and wetter winters
- more extreme weather
- heavy rain leading to flooding and changes to our coastline.

Over 11,000 people work for the Environment Agency in the UK to tackle environmental challenges. Our work keeps people, places and our environment safe. We need your help:

- Join Environment Agency experts to find out what we do.
- Find out about the environmental challenges we face.
- Use your problem-solving skills to help us to protect and enhance places, people and the environment.

Getting Started

Here are some simple steps you can take to get started with Minecraft: Education Edition

1. Get & Install **Minecraft: Education Edition** by visiting [here](#) – It's free to download and can be installed on many different types of devices.

2. Login into Minecraft: Education Edition with your Microsoft 365 account. Download and

start the world by searching for "Rivercraft" in the Library.

3. If you are new to Minecraft: Education Edition you can learn how to use the game with [Minecraft: Education Edition YouTube Channel](#). We recommend you start with:

a. [Getting Familiar with Minecraft: Education Edition](#) and

b. the [Basic Controls](#) Video.

More Learning

If you would like to learn more about using Minecraft: Education Edition, you should access the [Minecraft: Education Edition Teacher Academy course](#) found on MS LEARN.

Game 1 – Managing Flood Risk

Learning Outcomes

- Learn about different types of flooding
- Find out about how flood risk can be managed to protect people and places
- Use problem solving skills to trial and investigate flood management methods

Background Information

Flooding is a natural process and occurs when there is too much water in the catchment. Human activity has significantly altered natural drainage processes, often causing greater flood risk.

There are different types of flooding including fluvial, tidal and surface water flooding. See the glossary section for definitions of each type.

Flood impacts - flooding prevents communities living normal lives. Floods can mean that people have to move out of their homes and business premises, valuable property can be damaged or ruined, and the cost and time to repair buildings can be huge.

Flooding can be mitigated in some places, but not prevented entirely.

Different methods of flood risk management are used in different areas e.g. glass flood defence walls may be used in building conservation areas or where homes are close to the river. Natural flood management including flood storage areas may be used to 'slow the flow' and hold water back in a catchment.

Further information on flooding can be found at the Geographical Association [An introduction to flooding \(geography.org.uk\)](https://www.geography.org.uk)

Game 1 is based on a real-life flood risk management scheme in Preston, Lancashire, UK. This scheme will build flood defence walls next to the River Ribble.

Student Activities

Task 1

Students will spawn outside the Environment Agency office.

- Students should go through the doors and enter the office.
- Students can then interact with Environment Agency experts who are non-player characters in the game. They provide greetings and basic information.
- Students can explore the office environment.
- They should then select the expert character labelled as "Game 1 – Managing Flood Risk" and click the right mouse button to be teleported to the site.

Task 2

Students are teleported to the Preston Sea Cadet's building on the River Ribble.

- Students can explore the area and read the notice boards. The boards contain information on the different types of flooding that can happen.
- Students need to find the chest next to the Sea Cadet building and collect stone, glass and a pick axe.
- Students should then build a flood defence wall next to the river. It should be a layer of stone blocks at the bottom and a layer of glass blocks at the top.
- Once complete, the students should press the "press to flood" button on the Sea Cadet building.
- If the area floods, there is a gap in the flood defence that needs to be filled in with either stone or glass. The "press to clear" button should be pressed to remove the flood water.
- If the area doesn't flood, the flood defence has been built correctly.

Task 3

Once the flood defence is completed, the student should move to the expert character labelled as "Step 2", located at the end of the flood defence wall.

- The expert character has some information to read about natural flood prevention.
- The student should find the chest under the tree and collect a pick axe, grass, oak saplings, podzol and bonemeal.
- If the students press the "Test" button next to the chest, they will see that an area of grass and white concrete floods.
- They should then press the "Clear flood" button to remove the flood water.
- The student should then dig out the white concrete area using the pick axe.
- Once all the concrete has been removed, it should be replaced with some grass blocks and some podzol blocks. The oak saplings can be planted in the podzol blocks and fed with the bonemeal to grow the tree.
- Once completed, the student can press the "Test" button again. This will show a smaller area of flooding compared to when the concrete was in place.

Task 4: Bonus Game

The student should move to the expert character labelled "Bonus", located at the other end of the flood defence wall, near the Sea Cadet building.

- The expert character has some information to read about flood gates.
- The student should go to the chest next to the "Bonus" character and collect any items they think would help make a flood gate.
- Using the items collected, the student should build a flood gate on top of the blocks next to the "Bonus" character.

Game 2: Climate Change and Flooding

Learning Outcomes:

- Understand that climate change will lead to more frequent and more extreme flood events
- Find out about how making lifestyle changes and adapting now could reduce the future flood impact
- Investigate sustainable choices and understand the potential impact on the environment.

Background information

Climate change will cause more extreme weather events, including flooding.

Flooding will impact different communities around the world in different ways and populations will face different challenges.

In the UK, we expect to see:

- Winter rainfall is expected to increase by approximately 6% by the 2050s and by 8% by the 2080s, compared to a 1981-2000 baseline.
- River flows will be more extreme. Peak flows are expected to be up to 27% higher in the 2050s, while in the summer months river flows could be 82% lower by as soon as 2050.

Game 2 is situated in a house in Preston, Lancashire, UK. The player first sees a potential flooding scenario in 2050 and is then able to complete sustainable tasks around the house to reduce their carbon footprint and therefore reduce the impacts of climate change.

Student Activities

Task 1

Students will spawn outside the Environment Agency office.

- Go through the doors and enter the office.
- Students can then interact with Environment Agency experts who are non-player characters in the game. They provide greetings and basic information.
- Students can explore the office environment.
- They should then select the expert character labelled as “Game 2 – Climate Change and Flooding” and right click the mouse button to be teleported to the site.

Task 2

The students will be teleported to a flooded house in Preston, England in 2050.

- Students should follow the instructions of the first project expert, explore the flooded house, and go outside for their next steps.
- Once outside they will see animals on rafts. The student should then interact with the “Next Step” project expert who has information on what they can do to help prevent more extreme flooding in the future. They should click on the right mouse button to be transported back to the present day.

Task 3

Students will now be in the same house, but it isn't flooded. They will be asked to complete 4 activities in 10 minutes to help alleviate the effects of climate change. They can do the tasks in whatever order they wish.

- **WATER REDUCTION** – In this activity, students need to turn off the sink and shower taps as soon as possible to stop their wasted water game score from getting higher.
- **LIGHTING** – In this activity, students add daylight sensors to the roof of the house, but change them to reverse daylight sensors, so the lights only come on when it is dark outside.
- **SUSTAINABLE MEALS** – In this activity, students cook a sustainable, plant-based meal to reduce their personal carbon impact. They can cook different plant-based meals.
- **RECYCLING** - In this activity, students will take the rubbish from the bin and sort it correctly outside in the recycling area and will earn points based on how well they sort it.
- **RESULTS** - Once all the activities are completed, a water litre score and recycling score will be available. Whoever has the lowest water litre number wins, as they turned off the taps the fastest. Whoever has the highest recycling score wins as they sorted all the recycling quickly.
- Once all the activities are completed, the student finds the “Finished” project expert to teleport to the future again.
- Students are teleported back to 2050, but there is no flooding (however, the animals are free and roaming around the city!).

Game 3: Environment and Wellbeing

Learning Outcomes

- Understand that biodiversity is an indicator of the health of a local environment.
- Explore habitats (in Preston, Lancashire, UK) and identify UK native and non-native species
- Record facts about the UK native and non-native species

Background Information

Wildlife can flourish in towns and cities, especially in green spaces (e.g. parks, gardens and verges) and blue spaces (e.g. rivers, streams, ponds and lakes).

England is one of the most nature-depleted countries in the world due to its long history of industrialisation and land use changes over millennia. Large areas of habitats have been lost with 99.7% of fens, 97% of species-rich grasslands, 80% of lowland heathlands, up to 70% of ancient woodlands and up to 85% of saltmarshes destroyed or degraded. ([Reversing the Nature Crisis: Silent spring or Adlestrop? - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/news/reversing-the-nature-crisis-silent-spring-or-adlestrop))

The impacts on species have also been severe, with a quarter of mammals in England and almost a fifth of UK plants threatened with extinction.

To address these major declines in biodiversity that will only be accelerated by a changing climate, more land needs to be dedicated to nature conservation to act as refuges for nature and to mitigate against climate change.

Game 3 is set in Avenham Park, Preston, Lancashire, UK.

Student Activities

Task 1

Students will spawn outside the Environment Agency office.

- Go through the doors and enter the office.
- Students can then interact with Environment Agency experts who are non-player characters in the game. They provide greetings and basic information.
- Students can explore the office environment.
- They should then select the expert character labelled as “Game 3 – Environment and Wellbeing” and click the button to be teleported to the site.

Task 2

Students will be teleported to Avenham Park, Preston, England.

- Students should interact with the “Welcome” character for instructions and read the list of species behind the “Welcome” character.

- The UK native animal species that the student needs to find are: bees, foxes, otters, water voles and bats. The UK non-native species that the student needs to find are Himalayan Balsam and Japanese Knotweed.
- The student should interact with the “Workbook” character to gain access to the in-game workbook and camera. These can be used to record the findings of the wildlife search.
- The student should then explore the park and find each of the species, take a picture of them, put it in their workbook and write down the facts they learn.
- Opportunity for classroom discussion on the results of the wildlife search.

Extension Activities for Game 1

What types of materials can be used to construct flood defences?

Background - Flood defences can be created through either hard engineering construction or soft engineering.

- Examples of hard engineering: artificial structures such as walls, embankments, and artificial channels, using materials such as rock, concrete and steel.
- Examples of soft engineering: using natural materials and mimicking natural processes, such as the creation of reed beds, using natural materials to reinforce river banks like coir fibre, and installing large woody material in watercourses to hold the water back.

Why do you think most civil engineers and flood defence operations staff are male, and what barriers do you think exist that prevent women and girls training and applying for these roles?

Most civil engineers are male and, in 2018, the United Kingdom had the lowest percentage of female engineers in Europe. Many flood defence operations staff (who maintain flood defences) in the Environment Agency are also male.

- The typical role of a civil engineer in flood risk management involves construction design, project management, problem-solving and knowledge of science, technology and engineering.
- The typical role of a flood defence operations team member at the Environment Agency includes operating our defences (e.g. pumps and flood gates) and maintaining flood defences (e.g. grass-cutting, fixing broken assets and operating construction machinery).

Case studies – Flood Stories: Help Callum and Help Sali.

Background – The Environment Agency has developed resources which demonstrate what happens in a flood through the experiences of children. Children and young people experience disasters first-hand but often have very different viewpoints from adults. There are two 360 immersive videos (which can also be watched with basic 3D glasses) available at the link below. Additional teaching packs are also available to download for these case studies using the same link.

[Flood Stories - The 360 Lab \(hull.ac.uk\)](https://www.hull.ac.uk/360lab/flood-stories)

Hydraulic modelling is undertaken to determine where flood defences should be placed and at what height. What kind of information might be needed to build these computer models?

Background – hydraulic modelling is a form of computer modelling; it is a collection of mathematical equations that give a simple representation of reality. These models

show what happens to water in a river in a flooding scenario and can be used to predict what the level (height in m) and flow (m³/s) of the river will be at different points in time, in different locations of the river catchment.

- Information needed to build a river model includes: topographic survey of the river and floodplain, real-world rainfall data and river level/flow data from similar catchments, climate change information (e.g. how much will rainfall increase by in the future), and historical flood information from the catchment (e.g. photos, a mapped flood outline) to check that the model is accurate.
- Hydraulic modelling can be used together with historical flood information to produce detailed and accurate flood mapping to show areas at risk of flooding. For England, flood mapping is shown on the Environment Agency's website "Check Your Long-term Flood Risk". Students can search for their local area if they live in England. If you live in another country, why not search for a city such as Newcastle, Bristol or Nottingham. Similar websites are listed below for Scotland, Wales and Northern Ireland.

[Check the long term flood risk for an area in England - GOV.UK \(www.gov.uk\)](https://www.gov.uk/check-long-term-flood-risk)
(England)

[Flood Maps | SEPA - Flood Maps | SEPA](https://www.sepa.gov.uk/flood-maps) (Scotland)

[Cyfoeth Naturiol Cymru - Dewis Iaith / Natural Resources Wales - Language Select](https://www.naturalresources.wales/)
(Wales)

[Check the risk of flooding in your area | nidirect](https://www.nidirect.gov.uk/check-the-risk-of-flooding-in-your-area) (Northern Ireland)

Extension Activities for Game 2

Why is it important to reduce carbon emissions and our carbon footprints?

Background: A carbon footprint is a measure of the impact our activities have on the environment. It calculates the greenhouse gases we are expected to produce in all our activities and measures them in units of carbon dioxide (CO₂). The world average is about 4,000 kg of carbon dioxide per person per year. In the UK it is nearly 10,000 kg per person per year.

- Evidence has shown that Earth's temperature is rising due to an increase in greenhouse gases. This has created and will continue to create, a number of negative effects.
- In the UK, these negative effects are expected to include an increase in the frequency of flooding and an increase in the severity of flooding.

Calculate your own carbon footprint

Background: Many people do not understand their personal and family carbon impact. This can be done in a few minutes using an online tool such as:

[WWF Footprint Calculator](#)

[United Nations carbon footprint calculator \(climateneutralnow.org\)](#)

Extension Activities For Game 3

What are the impacts of invasive species? What other invasive species are there in the UK?

Background: An invasive species is an organism that typically causes ecological or economic harm in a new environment where it is not native.

- Invasive species are capable of causing extinctions of native plants and animals, reducing biodiversity, competing with native organisms for limited resources, and altering habitats.
- There are over 3000 invasive species in the UK. Other examples of UK invasive species are the Asian hornet, grey squirrels and American mink.

Otters and Water voles are protected species in England. What other species are protected by law? Why?

Background: Some species are legally protected. Legal protection can differ depending on the country, so some species which migrate across several countries may be protected in some places but not others.

- In England, the protected species include bats, great-crested newts, dormice, badgers and some species of birds.
- A list of protected birds, and how protection differs across UK countries and the Republic of Ireland, is shown in the following link [List of Protected Birds | BTO - British Trust for Ornithology](#)

Glossary

The following terminology is used in Game 1.

- **Catchment:** the area within the drainage basin.
- **Fluvial flooding:** flooding from a river or stream
- **Surface water flooding:** flooding that occurs on the ground surface when excess rainwater can no longer infiltrate the soil or enter the man-made drainage system.
- **Pluvial flooding:** another term for surface water flooding.
- **Slow the flow and natural flood risk management:** using natural materials and natural process to slow down the flow of water in a drainage basin, to reduce flood risk.
- **Tides:** tides are the alternating rise and fall of the sea surface. They are due mainly to the gravitational attraction (pull) of the moon and sun on the rotating earth.
- **Surcharge:** when a watercourse, drainage pipe or sewer is full, and causes water to back up the system.
- **Permeable surfaces:** these are surfaces that allow rainwater to soak through the surface.
- **Impermeable surfaces:** these are surfaces that do not allow rainwater to soak through the surface.

The following terminology is used in Game 2.

- **Carbon reduction:** activities which aim to lower the amount of carbon dioxide (CO₂) released into the atmosphere.
- **Solar array:** a group of solar panels.
- **Sustainability:** meeting the needs of current generations without compromising the needs of future generations. The responsibility to conserve natural resources and protect global ecosystems.

The following terminology is used in Game 3.

- **Invasive species:** an organism that typically causes ecological or economic harm in a new environment where it is not native.
- **Native species:** an organism that originated and developed in its surrounding habitat and has adapted to living in that particular environment.
- **Protected species:** an animal or plant which it is forbidden by law to harm or destroy
- **Ecology:** the study of the relationships between living organisms, including humans, and their physical environment.
- **Habitats:** the natural environment in which an animal or plant usually lives