



# The Crown Estate Sustainability Initiative

## The water cycle lesson

### Teacher guide

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#### OVERVIEW

Thank you for downloading these resources to use with your students. By equipping your students with the knowledge and skills to understand biodiversity, nature recovery and sustainability, you are empowering them with the tools to take positive action in their own communities, now and in their futures.

This lesson links to the Aquatic Adventure assignment in the Conservation Quest at Windsor Great Park.

Pupils will:

- Review their understanding of how we use water
- Explain the water cycle in their own words
- Explore how careers are important for protecting freshwater systems

Throughout the lesson, you will find background information on each topic. **There is also a glossary of key terms at the end.**

To find out more about how to use these resources, watch our teacher video on the website.



#### OUTCOMES

Pupils will be able to explain the processes of the water cycle and develop an understanding of the role of Hydrologists and Ecologists.



#### SKILLS

Teamwork, creative thinking, communication



#### VOCATIONS

Hydrologist, Hydrogeologist, Ecologist



#### RESOURCES

- Presentation slides
- A3 blank storyboard
- Role description cards on careers related to the water cycle

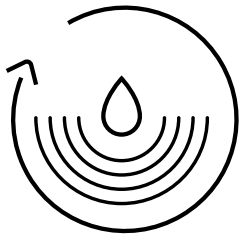


#### TIMINGS

We have included activities for your class that develop themes from the Minecraft worlds. They are sequenced to build on each other, but we encourage you to pick and choose the ones that will work best for your class and the time available. We have included approximate timings as a guide, but you may wish to spend longer on certain sections.

CONTENTS	TIME	PAGE
Introduction and gameplay	32 minutes	2
Starter activity – The uses of water	5 minutes	3
Main activity – Exploring the water cycle	35 minutes	4-5
Careers activity – Hydrologists and Ecologists	10 minutes	5
Reflection	5 minutes	6
Optional extension activity	10 minutes	6-7
Real world action		8
Glossary		9

Stats quoted in these lesson packs refer to the UK.




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### Introduction

 (2 minutes)

- Introduce pupils to the Conservation Quest at Windsor Great Park world that they are about to explore. Explain that this world will highlight biodiversity, sustainability and ecology and how our decisions can impact this in the long term.
- In the Aquatic Adventure, they learn about the water cycle first hand as they evaporate and precipitate, before dining under the pond to learn about aquatic producers, consumers and predators.


### Minecraft gameplay

 (30 minutes)

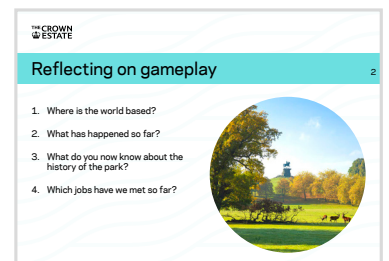
- When they launch the world, students will enter the lobby and meet Dotty the Dragonfly, their helpful guide. To take part in each challenge, students can visit the Windsor School from the estate office. In the school, there are four classrooms - and from each one, students can teleport instantly to a different challenge.
- For the purpose of this lesson, you may wish to direct students to teleport directly to the Aquatic Adventure assignment but they can come back and explore the world in their own time too.
- Consider sharing the reflection questions below with your students before they explore the world, so that they can keep them in mind throughout and ahead of class discussion.

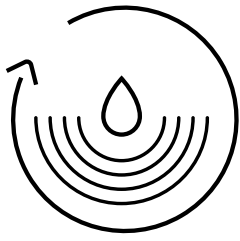


### Reflecting on gameplay (Slide 2)

 (5 minutes)

- Facilitate a class discussion about the world, encouraging pupils to reflect on new knowledge gained, anything they found challenging/easy/interesting
- To steer discussion, you could ask them:
  - Where is the world based?
  - What has happened so far?
  - What do you now know about the history of the park?
  - Which jobs have we met so far?






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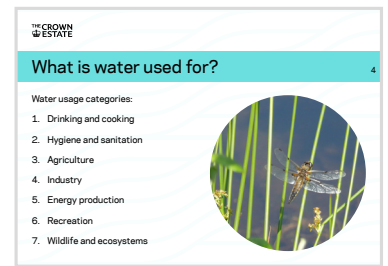
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### Starter activity – The uses of water (Slide 3-4)

 (5 minutes)

This starter activity will get your students thinking about their own relationship with water and the various uses it has.

- Ask the class to come up with 20 uses of water
- You may choose to split them up into teams of four but the class should reach 20 uses as a collective
- You can use flip chart paper or the white board and invite members of the teams to come up one at a time
- Set a count-up timer so that when you reach 20 unique uses, you can say 'we reached 20 in x minutes!'
- Use the following prompts if you need them:
  - How is water used to stay clean?
  - How is water used to keep us healthy?
  - Have you used water today?
  - What other forms can water take (e.g. ice cubes in drinks)
  - How is water used outdoors/in nature?
- Share the slide with the different water usage categories listed.
  - As a whole class, can the students put their suggestions into each category?
  - Are there any categories they haven't thought about?
  - Use the background information below to provide more information on any categories they are not familiar with
- Explain that, overall, water is an essential resource that is used in a variety of ways, and its availability and quality can have a big impact on human health, the environment, and economic development. It is important to use water responsibly and sustainably to ensure that it remains available for future generations.

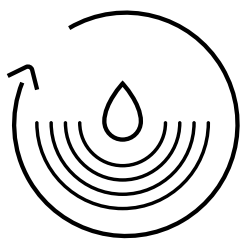


### BACKGROUND INFORMATION

#### The uses of water

People use water for a wide range of purposes, including:

- **Drinking and cooking:** Water is essential for human survival, clean and safe drinking water is necessary for maintaining health
- **Hygiene and sanitation:** Water is used for bathing, washing hands, cleaning clothes and dishes
- **Agriculture:** Water is used for irrigation to grow crops and for providing water for livestock
- **Industry:** Water is used in manufacturing processes, such as cooling and cleaning, and as a raw material in some industries
- **Energy production:** Water is used to generate hydroelectric power and for cooling thermal power plants
- **Recreation:** Water is used for swimming, boating, and other water sports
- **Wildlife and ecosystems:** Water is essential for supporting wildlife and ecosystems, including wetlands, rivers, and oceans




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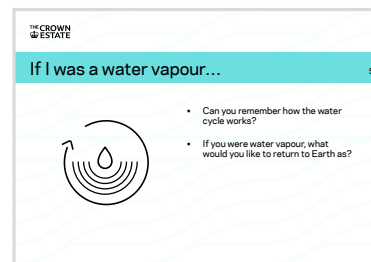
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### Main activity - Exploring the water cycle (slides 5-8)

 (35 minutes)

In this activity, students will recall their understanding of the water cycle and reinforce this through creative activities.

- Ask students to recall how the water cycle works.
- Ask them to think about the water vapour characters they met in the world – Can they think of the conditions in which the vapour comes down as rain, sleet or snow? If they were a water vapour, what would they like to return to Earth as? Ask them to explain their reasons why.
- Display the water cycle slide and review any words that students do not remember or don't yet understand.



### BACKGROUND INFORMATION

#### The water cycle and the UK supply of freshwater

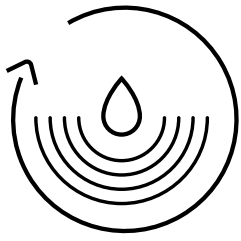
- **Evaporation:** The sun's heat causes water from oceans, rivers, lakes, and other bodies of water to evaporate and become water vapour in the atmosphere.
- **Condensation:** As the water vapour rises, it cools and condenses into clouds.
- **Precipitation:** When the clouds become saturated, the water droplets in them fall to the Earth's surface as rain, snow, sleet, or hail.
- **Infiltration:** Some of the precipitation is absorbed by the ground and becomes groundwater.
- **Runoff:** The rest of the precipitation flows over the land and into rivers, streams, and other bodies of water.
- **Transpiration:** Water is also taken up by plants and released into the atmosphere through a process called transpiration.

The water cycle, also known as the hydrologic cycle, is the process by which water moves between the Earth's surface, the atmosphere, and back again. This cycle is continuous and plays a vital role in maintaining the Earth's water balance. The water cycle ensures that water is constantly moving and being redistributed throughout the planet, necessary for life on earth.

In the UK, tap water typically comes from either surface water or groundwater sources.

**Surface water** is obtained from rivers, lakes, and reservoirs, which are often treated to remove impurities before they are supplied to consumers. Surface water sources may also receive runoff from urban and agricultural areas, which can affect water quality.

**Groundwater** is obtained from underground sources, such as aquifers, which can provide a more reliable and consistent supply of water. Groundwater sources are often less vulnerable to contamination than surface water sources, but may require treatment to remove impurities and ensure water quality.



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### Main activity - Exploring the water cycle (Slides 5-8) Cont'd

- Remind them that human activity can alter the natural balance of the water cycle. For example, building dams or reservoirs can change how much water is reaching plants.
- Next, in pairs, ask students to describe the water cycle using sequencing words (such as then, next, after that) in a paragraph or using the **storyboard template worksheet**. They might choose to describe it to each other in their own words first before creating the storyboard together.
- The first sentence has been written with the key words highlighted to support learners, e.g. Evaporation happens when ponds, lakes and the ocean are warmed by the sun.
- Once completed, display the model answers for students to review. Ask them to say what is good about them, how they can be improved and if they agree or disagree with anything in them.

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### Create a storyboard of the water cycle

Write sentences describing the process and then draw a picture:

Tell the story:  
Evaporation happens when ponds, lakes and the ocean are warmed by the sun.

Then:

Finally...

Key terms: evaporation, sun

Key terms: condensation

Key terms: precipitation

Key terms: runoff

Key terms: infiltration

Key terms: water stored

Key terms: exaporation

Key terms: cycle

### Careers activity - Hydrologists and Ecologists (Slides 9-11)

(10 minutes)

This activity will explore the jobs that Asella the Hydrologist and Buffy the Ecologist do as part of the Aquatic Adventure part of the world.

- Ask students which jobs they remember from the world that are related to the water cycle.
- Split the class into teams of four once more and hand each group one **role description worksheet**. Let each team know which role to focus on.
- Ask each group to read the role description together and write down answers to the following questions:
  - The main skills this person uses are...
  - This role is important because...
  - The most exciting thing about this role is...
- Next ask your teams to pretend they do those jobs and set each team the following challenges:
  - Hydrologists:** we have had a whole month of heavy precipitation, how might that impact other parts of the cycle?
  - Ecologists:** In a recent survey, we found the amount of detritus in the ponds was reduced. How might this affect the food chains?
- Invite each group to share their ideas with one another:
  - Are there ideas they had not thought of?
  - What can we do as consumers to help protect the water cycle and food chains?
  - Reiterate here that the three roles help to protect the water cycle and food chains.

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### Which jobs did you see in the world that are related to the water cycle?

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### Role descriptions

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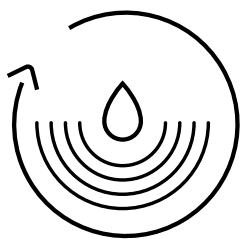
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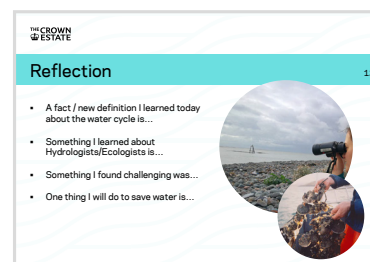
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### Reflection (Slide 12)


 (5 minutes)

Before finishing the lesson, encourage your students to reflect on their learning.

- Ask your students to use the following sentence starters to reflect:
  - A fact / new definition I learned today about the water cycle is...
  - Something I learned about Hydrologists/Ecologists is...
  - Something I found challenging was...
  - One thing I will do to save water is...
- Depending on your class, you may wish to do this one by one or invite volunteers to take turns.



### Optional extension activity

 (10 minutes)

There is so much more of the world to explore so if you have some more time, we'd encourage you to let the students engage in some free play in the world. If you would like to extend the learning from this lesson a bit further, you can try the following activity.

#### BACKGROUND INFORMATION

##### Maintaining healthy freshwater systems

There are several actions we can take to ensure our freshwater systems are healthy and promote biodiversity:

**Reduce pollution:** Pollution is a major threat to freshwater systems and can harm or kill aquatic plants and animals. We can reduce pollution by properly disposing of waste, reducing our use of pesticides and fertilisers, and reducing our carbon footprint to minimise the effects of climate change.

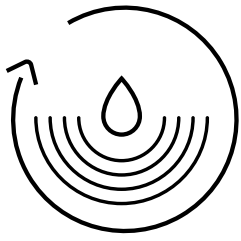
**Protect wetlands and flood plains:** Wetlands and flood plains act as natural filters for water and provide important habitat for many species. Protecting these areas helps maintain the health of freshwater systems and promote biodiversity.

**Manage water use sustainably:** Freshwater is a finite resource, and its overuse can have negative impacts on aquatic ecosystems. We can manage water use sustainably by conserving water, using water-efficient appliances and fixtures, and reducing water waste.

**Control invasive species:** Invasive species can outcompete and displace native species, disrupting the natural balance of freshwater systems. We can control invasive species by identifying and removing them from freshwater ecosystems.

**Support conservation efforts:** Supporting conservation efforts and initiatives to protect freshwater systems and promote biodiversity can help ensure the health and sustainability of freshwater ecosystems for future generations.






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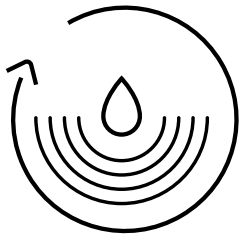
### Optional extension activity *Cont'd*

 (10 minutes)

#### The importance of protecting our water supplies

- Remind students that humans share our planet with many other living organisms, some of which they will have met in the freshwater Cow Pond in the world.
- To highlight how we are all connected to water because it never leaves the Earth, students will start thinking about water issues in their own area.
- In teams of four, ask students to create a poster to tell people about water issues in their own area and what they can do to help solve them.
- They can write or draw their thoughts but it should be informative and have some solutions.
- Use the following prompts if needed:
  - Could dropping litter cause a problem? (Yes because if it finds its way into our water system, it can cause pollution.)
  - Could planting trees help reduce flooding? (Yes, they help slow down water flow and their roots take up water.)
  - How can we reduce our water use? (By turning off the taps when not using them, having shorter showers, running smaller baths, reporting leaks.)
- Once they are finished, consider how you can take the findings further through our Taking Action activity.





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### Real world action

#### Building student agency with real world action

By taking part in this lesson, students have developed their:

- knowledge of a key sustainability topic
- understanding of why it is important
- practical toolkit, and articulation, of their own green skills

These are the ingredients that enhance students' agency and power to take real world action that builds biodiversity and supports nature recovery.

There are a number of ways you can support them to take their learning forward and continue this process beyond the classroom. We have a few starter ideas for you below:

- Some schools may have their own wildlife pond. A great project could be for students to consider how biodiverse their pond is by conducting a survey to find ways to improve it.
- Invite a representative from the local River Trust or Wildlife Trust to run a workshop for the children. Useful resources can be found on their websites.
- Challenge students to run an assembly to raise awareness about water issues in their area and how we can help each other use water more sustainably.
- Support students in organising a fundraising activity to help local wildlife, e.g. funding for more birdboxes, bug hotels, spring bulb planting.



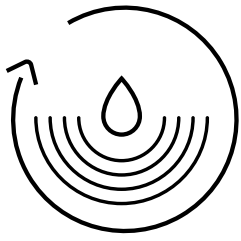
### Lesson 5 in this series - Taking action toolkit

For more ideas on safe and manageable ways to harness the enthusiasm your students may have for this or other biodiversity topics, we have created a **Taking Action Toolkit**.

It features accessible principles to empower students to identify key issues that they care about, affecting their school/local community, and begin creating meaningful solutions for nature recovery with their peers.







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### Glossary

- **Aquifer:** A geological formation that contains and can transmit groundwater.
- **Vapour:** The gaseous form of a substance, typically referring to water in its gaseous state.
- **Evaporation:** The process by which a liquid is converted into a gas or vapour, usually as a result of heating or exposure to sunlight.
- **Condensation:** The process by which a gas or vapour is converted into a liquid, typically as a result of cooling or a decrease in pressure.
- **Precipitation:** Any form of water that falls from the sky, including rain, snow, sleet, and hail.
- **Sewage:** Wastewater that contains human waste and other contaminants, typically from homes and businesses.
- **Meteorologist:** A scientist who studies and forecasts the weather, including temperature, precipitation, wind, and other atmospheric phenomena.
- **Hydrologist:** A scientist who studies the movement, distribution, and quality of water on Earth, including its cycle and interaction with other environmental systems.
- **Hydrogeologist:** A scientist who studies the geological and hydrological processes that influence the movement and quality of groundwater.
- **Ecologist:** A scientist who studies the relationships between organisms and their environment, including the ways in which water and other environmental factors affect ecosystems.
- **Freshwater:** Naturally occurring water on the Earth's surface in ice sheets, ice caps, glaciers, bogs, ponds, lakes, rivers and streams, and underground as groundwater in aquifers and underground streams. Freshwater is generally characterised by having low concentrations of dissolved salts and other total dissolved solids.
- **Saltwater:** naturally occurring water from the sea or the ocean.

