



Lesson plan – water resources

Year: 7

Lesson overview:

In this lesson students will identify the forms that water takes in the Murray–Darling Basin and learn the ways in which different waterways connect and how they are used as a resource. They will investigate the ways that the Murray–Darling Basin Authority is designing, planning and implementing projects with sustainability as its main priority. Students will examine and describe the connections that Aboriginal peoples have to water and land in the Murray–Darling Basin.

Aims and objectives:

Upon completion of this lesson students will demonstrate an understanding of:

- water as a finite resource
- how the water cycle works globally
- the various uses of water worldwide, and more specifically in the Murray–Darling Basin
- natural and physical features of the Murray–Darling system
- how surface water is stored and managed in the Murray–Darling Basin
- ways that flows of water connect places as they move across the environment
- the organisations that supply water to the Murray–Darling Basin
- the process of water treatment
- how the salt interception schemes are addressing the problem of salinity in the Murray–Darling Basin
- key Aboriginal figures and their connection to the Murray–Darling Basin
- the Aboriginal peoples' deep spiritual, cultural, social, environmental and economic connection to the lands and waters of the Murray–Darling Basin.

Key learning areas/subjects/strands: Geography

Australian curriculum codes:

[ACHGK037](#), [ACHGK038](#), [ACHGK041](#)

Curriculum content description:

ACHGK037 – Classification of environmental resources and the forms that water takes as a resource

ACHGK038 – The way that flows of water connects places as it moves through the environment and the way this affects places

ACHGK038 – Economic, cultural, spiritual and aesthetic value of water for people, including Aboriginal and Torres Strait Islander Peoples and peoples of the Asia region.



General capabilities:

Literacy, Critical and creative thinking, Personal and social capability, Information and communication technology capability, Intercultural understanding

Cross-curriculum priorities:

Sustainability, Aboriginal and Torres Strait Islander histories and cultures

Curriculum connections:

History, English

ScOT catalogue terms:

Water resources, human settlement, Australia, natural heritage, sense of place

Resources/materials:

Interactive whiteboard technology, YouTube video access, Google Earth.

Language/vocabulary:

Renewable, non-renewable, continuous, resources, finite, water cycle, groundwater, precipitation, infiltration, freshwater, catchment, tributaries, barrage, barrier, surface water, infrastructure, sustainability, development, Aboriginal, connection, cultural, spiritual, economic, environmental, social

Higher order thinking skills: (Bloom's taxonomy):

- knowledge
- comprehension
- application
- analysis
- synthesis
- evaluation

Lesson introduction:

1. Conduct the pre-lesson pop quiz.
2. Display and introduce the definitions of renewable, non-renewable and continuous resources on the interactive whiteboard.
3. Pose the question: 'Water is a valuable resource used by all people in all communities. Which resource group do you think it belongs to and why?' Lead students to the understanding that water is a finite resource which needs to be used efficiently and wisely.
4. Brainstorm the various ways fresh water is used by people worldwide. Possible answers include:
 - health – for drinking, personal hygiene, washing things etc.
 - social purposes – recreation (boating, swimming, watering public parks, golf courses, aquariums)



- economic use – in manufacture, power generation, for cooling (major water-using industries include steel, chemicals, paper and petrol refining)
- food production – in growing, processing and transporting goods.

Main body of teaching:

5. Display the 'Uses of water' slide. Ask students to study the images and take note of the way water is being used as a resource in the Murray–Darling Basin (MDB). They should then match an image with its correct type of resource use.
6. Explain to the students that they will be exploring the uses of water in the MDB throughout the lesson.
7. On the next slide, click and enlarge the water cycle diagram. Review that the water cycle is about the way that fresh water moves about the planet (from rainfall, of which most [94% in Australia] evaporates; some [4%] infiltrates into groundwater reserves; a tiny bit is transpired by plants, and the remainder ends up in surface water [lakes, rivers and streams] – this latter is also known as runoff). This is a closed cycle – no new water is created. On a global scale, some is locked in icecaps and not available for human use.

Extension: If students need further background, view [The Water Cycle in the Murray–Darling Basin](#) video. This is an initiative of the Murray Darling Association, Burrumbuttock Public School, the Riverina and Murray Regional Group of Councils (RAMROC), and the Murray Catchment Management Authority.

8. Display the next slide, and lead the class in labelling the diagram. Then, students draw their own diagram, labelling each stage. Ensure that sufficient 'white space' is left around the diagram to add some extra information shortly (see point 10).
9. Explain that in the MDB, people access both surface and groundwater. In some parts of the Basin (mainly in the west) groundwater is the only reliable water resource.
10. To investigate each water form, students participate in the following activities using the interactive whiteboard:
 - Groundwater slide – students click on each pop up and read the information provided. They then draw a 'pop-out' box on their water cycle diagram (eg. bottom left) in which they add the groundwater layers
 - Catchment slide – define the term: A catchment is an area of land into which water naturally runs off (collects) when it rains. It is often a depression bounded by hills. Read the information on the slide, then locate your own catchment by pan/zooming around the map.



11. Using the next 'True or false?' slide, students complete a true or false statement questionnaire. From this, they learn more about the way water moves around the landscape.
12. Students then view the pop-up map of the River Murray System on the interactive whiteboard. Read about the way the River Murray system is managed. Ask students to locate the:
 - Murray, Murrumbidgee and Darling rivers
 - Murray mouth
 - state borders.
13. Then, explain that the following structures (which they will be tasked with finding) all control the way the river runs (and therefore change what would have received water naturally):
 - the four biggest water storages: Dartmouth Dam, Hume Dam, Lake Victoria and Menindee Lakes
 - locks, weirs and barrages
 - the barrages built near the Murray mouth to stop sea water entering the river.
14. From these activities, students will gain an understanding of how the waterways connect places as the water moves through the environment and how it is used as a resource by farms and communities.
15. Launch the 'Locks, weirs and dams' slide, and explain that 'infrastructure' refers to physical and organisational structures and facilities including buildings, roads and power supplies. But in water resource management, it refers to things like dams, weirs, locks, pipes and channels. These control the flow of water in various parts of the landscape. Students complete the activity by placing the images in the correct order.
16. Explain to the students that there are a number of water suppliers to the Murray–Darling Basin. Three of these suppliers (from different areas) are:
 - Icon water (Australian Capital Territory)
 - North East Water (NE Victoria)
 - SA Water (South Australia).
17. On the next slide, students read information about Icon Water.
18. Then proceed to the 'Sustainability projects' slide and complete an activity to rate projects as 'sustainable' or 'non-sustainable'. Explain that a common theme encompassing all of these suppliers is sustainability (referring to the ability to maintain or support something). In water terms, it means the ability to manage and protect the long-term availability of water as a resource.



Sustainability can also be applied to the environment in general, as well as communities and the economy.

19. In the next activity (Water purification slide), students complete a flow chart which illustrates the process of how raw water is treated in water filtration plants. Explain that SA Water has one such system.
20. Next, launch the slide 'Land development'. Students investigate the major town of Mildura, Victoria in the Murray–Darling Basin. Using Google Earth students investigate the extent of development that has occurred in the town. Students locate the following landmarks and features:
 - floodplains around the river (visible as grey, partly-vegetated areas) – discuss that these areas naturally flood after heavy rain (and look at how close human use is to them). Discuss how the river has moved so often in the past (by looking at all the oxbows and channel patterns)
 - all the grids of farmland that rely on pumping water from the river
 - saline lakes (e.g. Lake Hawthorn and Lake Ranfurly)
 - large salt evaporation basins near Buronga and Merbein (there are four salt interception works sites around the area)
 - weirs and locks (e.g. Mildura weir (Lock 11) near Lock Island, Weir no. 7 (Rufus River), Weir no. 8 (Wangumma) above Lake Victoria – the latter two have locks beside them)
 - any other water-dependent features they can identify (e.g. golf courses).
21. Explain that in order to develop all these features, the land has undergone huge transformation, including deforestation and land clearing.
22. From the next slide (Salt interception schemes), launch the video which shows how salt interception schemes work in the Murray–Darling Basin. After viewing the video, pose the question: 'What three human activities have contributed to increasing the amount of saline groundwater entering the river?' (Answer: land clearing, irrigation developments and river regulation).
23. Explain to the students that the Murray–Darling Basin Authority (MDBA) was established to maintain and protect our rivers. The salt interception schemes are one way that they are addressing the issue of salinity.
24. On the next slide 'Salt Interception Scheme', students complete the close passage to consolidate their gained knowledge from the previous two activities.

Extension: Students research the North East Water organisation and write down three ways it is addressing sustainable water use in the Murray–Darling Basin.



25. Ask the students if they can name some important Aboriginal figures. (Possible answers include Cathy Freeman, Nova Peris, Adam Goodes, Evonne Goolagong–Cawley [sports people], Samantha Harris [model], Jessica Mauboy, Ernie Dingo, Albert Namatjira [arts], Eddie Mabo [Indigenous rights activist], Neville Bonner [politician]). Then launch the slide showing David Unaipon. Ask if anyone knows who the person is or where they have seen them. Progress to the next slide which gives information on him, including that he came from the Murray mouth area (Coorong) in the Murray–Darling Basin.
26. Progress to the Evonne Goolagong–Cawley slide and repeat. Evonne was born in Griffith, also in the Basin. Highlight to the students that the Basin has been home to Aboriginal people for around 50,000 years and that today, 46 Aboriginal nations have close associations to the land and water of the Basin.
27. Launch the next slide ‘Ringbalin: river country spirit ceremony’ and read the text, then play the video. This video explains the spiritual connection of the Ngarrindjeri people to the Murray–Darling river system. (<https://www.youtube.com/watch?v=GqrRfyVNqlo>)
28. After viewing the film ask students to share one or two words that describe the ways Aboriginal peoples view the Murray–Darling river systems. For example: life force, spiritual, dependent, connectedness, ancestor connections, cultural links, richness, respect, tradition, etc.
29. Next, progress to the ‘Aboriginal connection to the Murray–Darling Basin’ slide. Click on each hotspot and read the information provided on the ways Aboriginal peoples are connected to the land and water in the Murray–Darling Basin. Ask the students to classify each image as either a cultural, social, environmental, spiritual or economic connection (or a combination of each).

Extension: investigate the Brewarrina fish traps (believed to be the oldest man-made structures on earth, built by Aboriginal people on the Barwon River. Watch the Dr Dave video: <https://www.youtube.com/watch?v=Qa5WSRxpUj0>

Conclusion

30. Conduct the post-lesson pop quiz.



Answers

Pre-lesson quiz questions	Answers	
1. Water is used for agriculture, industry and food production all over the world.	true	false
2. What is the name given to the circulation of water between the Earth's oceans, atmosphere and land is _____.	the water cycle	the lifecycle of water
3. Water can only be derived from surface water, e.g. rivers.	true	false
4. When talking about rivers, 'infrastructure' refers to _____.	dams and weirs	rivers and lakes
5. The Aboriginal peoples have a deep spiritual connection to the lands and waters of the Murray–Darling Basin.	true	false

Post-lesson quiz questions	Answers		
1. The process of applying water to crops is called _____.	irrigation	reservoirs	weirs
2. A _____ is a hole drilled into the ground to access water.	pump	bore	water table
3. An organisation that supplies water to parts of the Murray–Darling Basin is _____.	WA Water	Icon Water	Sydney Water
4. The term 'sustainability' refers to the ability of something to be maintained.	true	false	
5. The Murray–Darling Basin Authority is addressing the issue of salinity with _____.	sustainable infrastructure	building dams	salt interception schemes