

WATERWATCH



Upper Murrumbidgee

EDUCATION



Underwater Habitats

Primary Education: Years K - 6

Classroom resource adapted from 'Sustaining River Life' Unit 4.5 *Underwater habitats*.

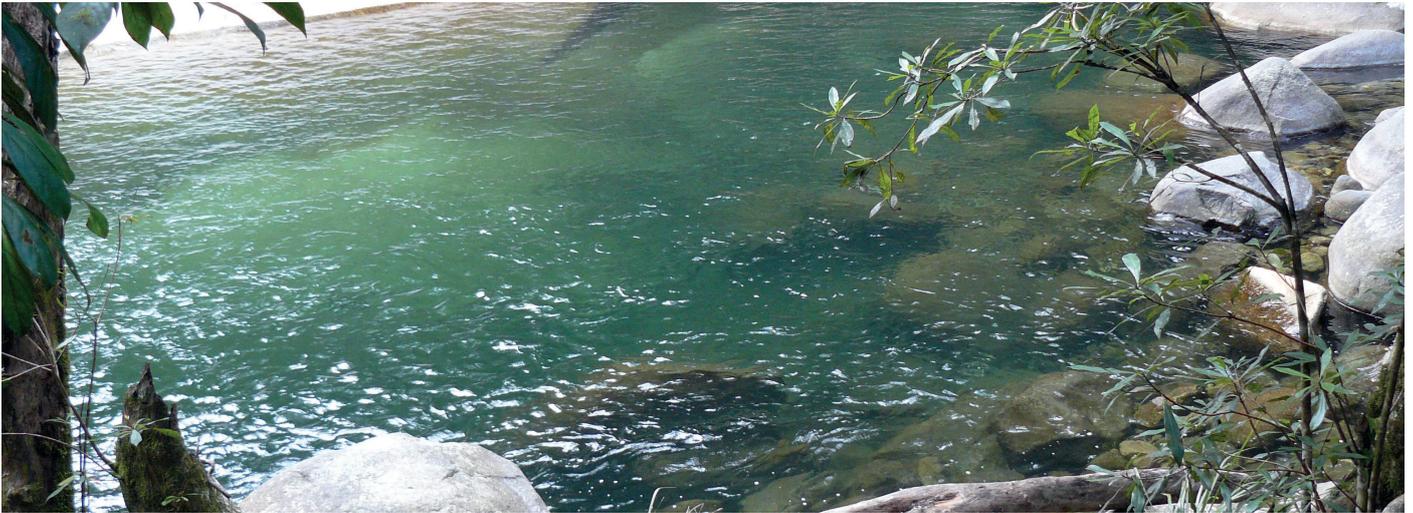
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Underwater Habitats



Background Information

Today, it is difficult to find a waterbody that ecologists would consider pristine and in natural condition. However, it is likely the First Australians managed the land and waters in a way that allowed for very healthy freshwater habitats to be far more common than today. Living on Country for such a long time allowed the First Australians, through careful observation, to intimately understand their environment.

The changes that came with European settlement has meant that the environment, including our freshwater creeks and rivers, has become more degraded with a continued downward trend. This is why scientists and the community are interested in careful observation in order to identify needs and better manage underwater habitats.

To understand these ecosystems, we must explore the many contributing factors of freshwater environments. This requires comprehending, physical, biological, chemical and energy processes and pathways. A good place to begin is to investigate how the movement of 'water through the landscape' (hydrology) can play a major role in creating a variety of underwater habitats.

Flow and habitat

It is important to understand the function of freshwater habitats found within creeks and rivers. These habitats will determine whether aquatic wildlife such as fish, platypus and invertebrates (water bugs) are present in the system and in what numbers (abundance). Flow patterns, such as seasonal flows or human-imposed patterns such as a result of dams, are also a major factor in determining the type and variety of available habitat. Other factors that can also influence the viability of aquatic life, in addition to habitat, include; water quality (the condition of water as a consequence of its physical and chemical state), riverbank and floodplain condition, food supply, competition for resources and also predation.

Different flow habitats include waterfalls, cascades, riffles, pools and runs. Different substrate habitats include mud, sand, gravel, cobble stones, boulders, packs of leaf litter, terrestrial plant roots and stems, submerged and floating aquatic plants and large woody debris (known as LWD or snags). These all provide different structural resources for a range of aquatic life seeking breeding ground, shelter, rest and feeding opportunities.

Inputs to the river (such as farm or urban pollution or sediment from soil erosion) and waterway modifications (like straightening or concreting channels, removing snags, dam construction and water diversions) can significantly reduce or degrade in-stream habitats.

Vocabulary

Substrate Pool Riffles Runs Glide Channel Snags Sediment Woody debris
Leaf litter Cascade Rapids

Objectives

Students gain an understanding of the various types of underwater habitat and the wildlife that make use of them.

Students understand that fish, turtles, platypus, rakali (water rats), tadpoles and water bugs need specific and healthy underwater habitats to survive.

Students learn about human-induced impacts on river habitats and their associated plants and animals.

Students understand the environmental conditions under the presence of First Australian people prior to white settlement.

Duration of lesson

1 hour (+ additional lesson for animal research if desired)

Useful Materials

- Teacher to find First Australian dreamtime stories to tell the students.
- Video of Tiddalik (<https://museums victoria.com.au/bunjilaka/about-us/creation-stories/>).
- Teacher to find simple images of aquatic animals from books or internet such as fish, turtles, platypus, rakali (water rats), tadpoles, water bugs. The Water Bug Detective Guide provides images and information on a range of macroinvertebrates: www.act.waterwatch.org.au/Files/Bugs/Macro Diagram Sheet 1.1.pdf.
- Teacher to use pictures of stream habitats and features, listed in the 'Vocabulary' section and from images below in 'Glossary of Terms' section, as well as books or internet.

Lesson plan

1. Using the resources found in 'In-stream habitat stories' below, create age appropriate stories to convey information about in-stream habitats.
2. Tell the students a dreamtime story or watch the dreamtime story Tiddalik with the students. This will help in understanding the importance of caring for our waterways.
3. Explain to the children how First Australian peoples cared for Country, including the waterways, through careful observation, law and totems.
4. Using the above resources, point out aspects of in-stream habitat such as large woody debris (snags), pebble or cobble stream-beds as well as aquatic plants, reeds and rushes growing in the water.
5. Ask students what these freshwater habitats might offer different types of aquatic life such as fish, turtles, platypus, rakali (water rats), tadpoles and water bugs. Discuss all animals' basic needs for survival such as food and shelter.
6. Discuss how some animals might be better suited to different flow rates.

Lesson plan continued

7. Model different aquatic animals with the children to aid in the understanding of their different features. Use clay, beeswax, fimo or other craft material.
8. Create an underwater habitat on butcher's paper in the classroom or in a sand tray or sandpit. Add elements from nature such as pebbles, sticks, sand, leaves to create different habitats.
9. Ask the children to place their modelled animals into the place in which they think they would live.
10. Ask the students what their modelled animal's needs might be.
11. Discuss what might adversely affect the health and well-being of aquatic habitats and the animals that live there.
12. Discuss how people and society may have either positive or negative impact on in-stream habitats. Could we improve the state of underwater habitats? How?
13. What actions could be done locally to protect existing underwater habitats? What would be the result of these proposed actions?

Glossary of Terms



Glossary of Terms, continued

Channel - A low lying path, eroded through the landscape in which the river or stream travels.

Glide - A stretch of smooth, flowing water, sometimes similar to a riffle but without broken, turbulent flow.

Habitat - An ecological or environmental niche that is inhabited by a particular type of animal or plant particularly suited to that niche.

Pool - A section of a river or creek in which the water is deep and the flow velocity low. Pools can sometimes be associated with greater channel width or immediately below waterfalls. They can be important refuges for fish, especially in hotter, drier seasons.

Riffle - A shallow stretch of a river or stream, where the flow velocity is high, and the water surface broken and turbulent. Riffles are often associated with larger substrate particles, such as cobbles and small boulders.

Run - An area in a stream or river where water moves smoothly, unhindered by constrictions, riffles or cascades.

Sediment - Material composed of particles derived from processes of abrasion, weathering and erosion. It is subsequently transported by the action of fluids such as wind, water, or ice, and deposited when the force of gravity is greater than the force of transport.

Snags - Large woody debris lodged in a waterbody.

Substrate - The bed material that exists in the bottom of an aquatic habitat, such as silt, mud, sand, gravel etc.

In-stream habitat stories (Years K - 2)

Before settlement by Europeans

Water is very important for First Australian people. Waterbodies such as streams, rivers, lakes, lagoons and billabongs are often places of significance which are told through dreamtime stories and songs. The Rainbow Serpent is often connected with water and the creation of waterbodies.

The first people to live in the upper Murrumbidgee area were the Ngunawal, Ngambri and Ngarigo peoples. They have lived here for more than 21,000 years. Living in Country for such a long time they understood, through careful observation, how everything in nature is interconnected. They only took from the freshwater habitats what was needed and no more. They cared for Country and made sure that the environment was never hurt. As they cared for Country, it in turn, cared for them. This was their law.

These First Australian people made their law by sharing knowledge of the land and waters and any changes they noticed, with each other. They did this through stories and songs, mimicking and imitating what they saw in dance and in ceremony. Also, every person, family and clan were given a totem from nature to honour and protect. All this made sure that everything in the landscape was looked after. Australian rivers and streams once had lots of different watery habitats for both animals and plants to live. The water flowed from cold swift mountain streams eventually becoming slow moving, low-lying floodplain rivers.

Sometimes floods allowed water animals to move easily across the landscape to find good habitat and breed. Floods also helped to spread plant seeds and water the trees across the floodplain. Sometimes the rivers dried, creating pools and became excellent breeding areas for frogs. Large fish also passed the dry summers in deep pools in the river channel.

Water temperatures rose and fell over the year, this told fish when to breed and grow. Trees lined the river's edge keeping the water clean and clear. When the trees fell, they became habitats in the rivers, for a variety of animals, from water bugs to fish. There were no pest fish in the rivers of these times.

Settlers arrived

Settlers arrived and didn't understand this new land as First Australians did. They began to change the land and rivers. Trees that fell in the river were removed to make it easier for boats to pass. The idea of habitat for the animals was not considered. Land, especially in open valleys, were cleared of trees for farming. This caused soil to wash into the rivers when it rained, which changed them, covering up the plants and rocks and making them shallower in some places. The rivers still continued their cycles of flooding and drying and mostly continued to provide healthy habitats.

The cold parts of rivers up in the mountains didn't change very much. But by 1908, fish that didn't belong in Australia such as Carp, Goldfish, Redfin perch and Brown trout, had been put into many rivers. These fish caused problems and upset the natural balance.

Damming the rivers

Barriers such as dams and weirs were built across rivers to hold back water and make it easier for people to get freshwater for towns and farms. As more people came and the need for water increased, more dams were built, which altered the natural flow of the rivers. With the damming of rivers, fish were no longer able to swim up and down the rivers. The timing of egg laying was upset by changed river flows and unusually cold water released from deep dams. The natural flooding flows that cleaned out the rivers, were now mostly held back by dam walls. Without floods to clean out the rivers, rocky river bottoms were often covered with sand and mud. Trees near the river died back as the lower water levels left many high and dry. More trees were cut down and more sheep and cows were grazing the land, causing more nutrients and soil to end up in the rivers.

In-stream habitat stories (Years 3 - 6)

Before settlement by Europeans

Australian rivers and streams once had lots of different habitats for both animals and plants to live.

The first people to live in the upper Murrumbidgee area were the Ngunawal, Ngambri and Ngarigo peoples. They have lived here for more than 21,000 years. Living in Country for such a long time they understood, through careful observation, how everything in nature is interconnected. They only took from the freshwater habitats what was needed and no more. They cared for Country and made sure that the environment was never hurt. As they cared for Country, it in turn, cared for them. This was their law.

These First Australian people made their law by sharing knowledge of the land and waters and any changes they noticed, with each other. They did this through stories and songs, mimicking and imitating what they saw in dance and in ceremony. Also, every person, family and clan were given a totem from nature to honour and protect. All this made sure that everything in the landscape was looked after. The rivers and streams had a big variety of riffles, glides, runs and deep pools, changing as they flowed downstream and changing over the seasons. The water flowed from cold swift mountain streams and eventually became slow moving, low-lying floodplain rivers.

Sometimes, floods allowed the animals that lived in the water to move easily across the landscape to find new habitat and breed there. Fish, turtles and platypus might go exploring in response to higher flowing water. Floods also helped to spread plant seeds and water the trees across the floodplain. Water birds also took advantage of flooded wetlands to feed upon the abundant life and to breed.

Other times the rivers dried, creating pools and became excellent breeding areas for frogs or fish. Large fish also survived the dry summers by moving into deep pools in the river channel.

Water temperatures rose and fell over the year, which told fish that it was time to breed and lay the eggs of coming generations. Trees lined the river's edge keeping the water cooler, reducing evaporation, while plants growing up the slopes helped keep the water clean and clear. When the riverbank trees fell, they became useful habitats in the rivers. There were no pest fish in these rivers, only the native fish that had been there for a very long time.

Europeans arrived

European settlers arrived and didn't understand this new land as First Australians did. They began to change the land and rivers. Trees that fell in the river were seen as a problem for boats to pass through and were removed to make it easier for boats to pass. The idea of habitat was not yet considered. The trees growing on the plains were easy to access for timber and trees near rivers could be cut down and floated to harbours for shipping away or to mills for lumber production.

Land, especially in open valleys, were further cleared of trees for farming. This caused soil to wash into the rivers when it rained, which changed them, making them shallower in some places and smothering the rocky areas with fine sediment. This reduced the quality of habitats for the animals. Wetlands were drained to provide more pasture for sheep and cattle. The rivers still continued their cycles of flooding and drying and mostly continued to provide healthy habitats where sediment had not become a problem. Over time, as low lying forests were reduced, the timber getters moved into steeper country, where soil erosion problems would become worse.

The cold parts of rivers up in the mountains didn't change very much. But by 1908 fish that didn't belong in Australia such as Carp, Goldfish, Redfin perch and Brown trout, had been put into many rivers. These fish caused problems and upset the natural balance. Many native fish reduced in numbers as they could not compete with the newcomers. The pest fish Carp, was very successful in spreading throughout the rivers and made the rivers muddier than their natural condition.

Damming the rivers

Barriers such as dams and weirs were built across rivers to hold back water and make it easier for people to get freshwater for towns and farms. As more and more people came, the need for freshwater increased. More dams were built, which altered the natural flow of the rivers. The water backed-up above the dams flooded forests and killed many trees and the area below the dam wall lost a lot of their much needed flows. The number of natural habitats for plants and animals was reduced over time.

With the damming of rivers, fish were no longer able to swim up and down the rivers which meant, the area where they lived became reduced. The timing of egg laying was upset by changed river flows and unusually cold water. This cold water was being released from the bottom of these deep water dams at times when the water should have been much warmer.

The natural flooding flows that scoured and cleaned out the rivers, were now mostly held back by dam walls. This meant many more rocky river habitats became covered with sand and mud. This lack of floods also meant that trees near the rivers and wetlands, began to die out and their seeds were no longer spread across the land. The rivers were also having problems from that sheep and cows now living on the surrounding land. Grazing and land clearing increased, causing even more soil and too many nutrients to be washed into the rivers.

Today

Many underwater habitats have been changed dramatically and in some cases lost from some river systems altogether. Today, however, with better understanding of our environment, we can make improved decisions as to how to manage the landscape including our rivers, wetlands and creeks.

For instance, the building of dams and the water they contain undergoes consideration for the needs of both society and the environment. We now have concepts such as 'environmental impact assessment' and particularly in the case of watery habitats, we have the phrase '-environmental flows'. So, even though the Australian population continues to grow and need more land and freshwater, we do have the knowledge, understanding and skills to consider and take better care of our freshwater habitats.

APPENDIX 2: AQUATIC ANIMAL CARDS

Have the students research and then draw the aquatic animal named on each card.

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|------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------------|
| <p>Mayfly Needs: clean clear water</p> | <p>Damselfly Needs: clean water, reeds/rushes</p> | <p>Planaria Needs: water</p> |
| <p>Backswimmer Needs: water</p> | <p>Caddisfly Needs: clean water</p> | <p>Mosquito larvae Needs: water</p> |
| <p>Dragonfly Needs: water, reeds/rushes</p> | <p>Water Mite Needs: clean clear water</p> | <p>Alderfly Needs: clean clear water and riffles</p> |
| <p>Stonefly Needs: cold clean water, riffles</p> | <p>Yabby Needs: moderately clean water</p> | <p>Freshwater Prawn Needs: moderately clean water</p> |

AQUATIC ANIMAL CARDS

| | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Leech Needs: water</p> | <p>Freshwater Mussell Needs: moderately clean water</p> | <p>Carp Needs: water</p> |
| <p>Mountain Galaxis (fish) Needs: cold clean water, riffles</p> | <p>Caddisfly Needs: clean water</p> | <p>Mosquito larvae Needs: water</p> |
| <p>Macquarie Perch Needs: clean clear water, deep holes, seasonal flooding, fish ladders around dams, snags, stable water temperature</p> | <p>Bony Herring (fish) Needs: water, fish ladders, stable temperatures</p> | <p>Silver Perch (fish) Needs: clean clear water, riffles and races, seasonal flooding, fish ladders around dams, snags, reeds, stable water temperatures</p> |
| <p>Green and Golden Bell Frog Needs: clean still water, reeds, No fish.</p> | <p>Platypus Needs: clean, clear water</p> | <p>Murray Crayfish Needs: cold clean water, snags, gravel or sand stream bottom</p> |