Georges Riverkeeper

Water... WOW!

STAGE 3 EDUCATION

Module 9: Scientific Water Testing (Field Trip or Game)

It is infeasible to measure all of the pollutants that may exist in a waterway. Instead, scientists monitor 'indicators' such as water bugs to measure the condition of waterways.

In this module, students will:

- understand the meaning of tolerant and sensitive water bugs
- observe water bugs from their local waterway
- identify water bugs using a Waterbug Identification Guide, as an indicator of the quality of the water from which the bugs were collected

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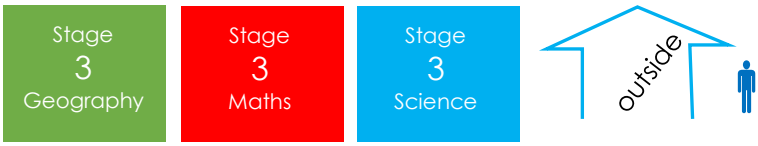
Module 9: Scientific Water Testing (Field Trip)



Teacher Background

Measuring Water Pollution (GE3-2 explains interactions and connections between people, places and environments.)

In *Module 8: Water Pollution*, students learned about the sources and effects of water pollution. It is possible to measure water pollution directly using probes or collecting samples for analyses in scientific laboratories. But, there are many pollutants that have many different effects. Also, many of the worst pollutants do not stink or make water dirty; they are largely invisible, although they can have serious consequences for natural environments and human health. It is infeasible to measure all of the pollutants that may exist in a waterway. Instead, scientists monitor 'indicators', which provide an indication of the suitability of waterways for different uses, the relative condition of the waterway and the likelihood of the presence of a suite of other unmeasured pollutants.

Sometimes the choice of pollutant that is measured may be determined by the intended use of a waterway, with different levels of purity required for different uses. Drinking water needs to be extremely clean, the water we swim in should be very clean, whereas if the water is being used to water sportsfields, it doesn't need to be as clean. For example, at swimming bathes the main health concern is a nearby sewage spill, which can be assessed by measuring bacterial concentrations.

Another reason for using indicators is that some pollutants of water have lingering effects even after the pollutant itself has been washed away and is no longer detectable. For example, if a large amount of old pesticide was thoughtlessly poured down a drain, it would wipe out most of the animals in the local waterway and the effects could be seen even after the pesticide itself had been washed further downstream. Often it is more practical to measure the effects of a pollutant, rather than trying to capture the pollutant itself.

Using Waterbugs to Measure Condition of Waterways (ST3-4LW-S Examines how the environment affects the growth, survival and adaptation of living things. GE3-3 compares and contrasts influences on the management of places and environments.)

In *Module 6: Living Things in Water*, students learned about adaptations of animals to living in water. They have adapted to living under certain environmental conditions. But, if those environmental conditions change, particularly if they change rapidly, the animal may not be adapted to the new conditions. Animals can be sensitive to changes in water quality, the amount and speed of water flow, and the habitat available in waterways. These are all altered by the introduction of stormwater to waterways near urban areas. So, we can sample water bugs as an indicator of how much waterways have been altered. Those waterways that flow through forest usually have lots of different native waterbugs that can survive within the undisturbed environment. Conversely, there are only a few waterbugs that can survive in highly disturbed waterways. If only fly larvae, snails and leeches survive in a waterway, it tells us that the waterway is very unhealthy. This is an easier way to measure the condition of the waterway than trying to measure all potential pollutants, because there are a multitude of pollutants in some waterways.

Sequence for Module 9: Scientific Water Testing	
Syllabus Outcomes	**ST3-1WS-S** Plans and conducts scientific investigations to answer testable questions, and collects and summarises data to communicate conclusions. **ST3-4LW-S** Examines how the environment affects the growth, survival and adaptation of living things. **GE3-3** Compares and contrasts influences on the management of places and environments. **MA3-17MG** Locates and describes position on maps using a grid-reference system.
Learning Intentions	For students to: ♦ locate their local waterway using Google Maps ♦ understand the meaning of tolerant and sensitive bugs ♦ observe freshwater macroinvertebrates from their local waterway ♦ identify freshwater macroinvertebrates using a Waterbug Identification Guide ♦ sketch and label a waterbug ♦ determine the quality of the water through observation and identification of waterbugs
Teaching & Learning Activities	Inquiry Question: *How can we test the quality of our local waterway?* ♦ What is the quality of our local waterway? Introduce students to the Waterbug Guide. Observe the pictures of waterbugs in the guide. What differing features do they have? Explain to students that certain waterbugs are sensitive or tolerant to pollution. If the water is polluted, sensitive bugs are the first to die. Tolerant bugs, on the other hand, are more resilient to the effects of pollution. What are some waterbugs on the identification guide that are known to students? **ST3-4LW-S** ♦ Using Google maps, locate the nearest local waterway. Watch the Waterbug Blitz instructional video and if possible, undertake a waterbug survey at the local waterway. Alternatively, contact Georges Riverkeeper or the Georges River Environmental Education Centre for advice about school excursions involving scientific monitoring along the Georges River. **MA3-17MG**, **ST3-1WS-S.** It is also possible to Download the Junior Waterwatch Teacher's Guide and Field Manual for many great waterway monitoring suggestions. ♦ Through identification of the waterbugs, students are challenged to determine the quality of their local waterway.**ST3-1WS-S** ♦ Students partake in a scientific sketch of one of the waterbugs identified from the water sample. Label adaptations beneficial for life in water, thinking back to Module 6. **ST3-4LW-S** ♦ For those unable to venture out to a local waterway, an alternative is the Catchment Detox game: Managing Australia's waterways is a huge challenge with climate change, increased

	demand for water and environmental problems putting our rivers under stress. This game & audio looks at catchment management. **GE3-3**
Resources	> Streamwatch Waterbug Guide https://media.australianmuseum.net.au/media/dd/Uploads/Documents/26879/Steamwatch%20Aquatic%20Macro%20Invertebrate%20Guide.914cd59.pdf > Waterbug Blitz instructional videos: https://www.waterbugblitz.org.au/Resources > Waterwatch manuals https://www.nswwaterwatch.org.au/resources/waterwatch-manuals > Catchment Detox http://www.abc.net.au/science/catchmentdetox/files/home.htm
Feedback	Your feedback is important to us. Please complete this quick online survey: http://bit.ly/ModulesFeedback

Contact list:

- Georges River Environmental Education Centre (https://georgesriv-e.schools.nsw.gov.au/, email: georgesriv-e.school@det.nsw.edu.au)
- Georges Riverkeeper (http://www.georgesriver.org.au/, email: contact@georgesriver.org.au)

Biographies of authors

Dr David Reid

David is a scientist who studies waterways for his work at Georges Riverkeeper in southern Sydney. He grew up near Lake Macquarie and the beaches south of Newcastle, where he spent much time swimming, surfing, exploring the life in water and generally enjoying being close to water. After finishing school, he went to university and his studies eventually led to completion of a PhD on waterbugs and food webs in farmland streams. Gaining those qualifications has allowed him to do research and monitoring work in waterways around the world, including those in New South Wales, Victoria, South Australia, New Zealand and New York City (see https://www.researchgate.net/profile/David_Reid15). He still enjoys having fun in water too!

Antonina Fieni

Antonina loves rivers. She is often seen paddling up rivers and creeks looking for Eastern water dragons or sacred kingfishers. When not paddling, Antonina is teaching environmental science and geography at the Georges River Environmental Education Centre and at the Field Study Centre at Sydney Olympic Park. Her qualifications include a Bachelor of Education and a Graduate Diploma in Environment.

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PO Box 205

Hurstville BC NSW 1481

Australia

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Georges Riverkeeper is an alliance of Councils with collective responsibility for the Georges River and its catchment.
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