Resourcing your own macroinvertebrate sampling kit

To borrow a macroinvertebrate sampling kit contact your regional River Detectives coordinator to make a booking and arrange pick up / delivery.

To set up your own macroinvertebrate kit you'll require;

*** Most equipment is cheap and readily available. The best net and trays come at a cost. Maybe you could apply for a grant to obtain these items ?*

- A sampling net. A specialist net with very fine mesh is recommended. A large net for use by adults can be purchased from Embrace Ecology's Waterbug Shop or you can purchase a set of smaller student nets. The best samples are taken with heavy duty nets and a vigorous action so we usually use a net purchased from Westlab. They come in three components; the frame, the net itself and the extendable pole (if you already have a water collection pole, the bottle holder head can be interchanged with the net head so you won't need to buy the pole component)

Please note we do not recommend entering the water to collect your sample so kick nets are not advised.

If on a tight budget, you can make your own scoop net with these instructions (mesh must be fine).

- Good heavy duty buckets with lids for holding and transporting sample water (two buckets is plenty for a class activity)

- Shallow trays (1 per 4 students works well). White trays give the best contrasting background to the bugs. They can be purchased from Embrace Ecology's Waterbug Shop or from Westlab.

If on a tight budget, you can use your own shallow clear plastic tubs with laminated white paper underneath.

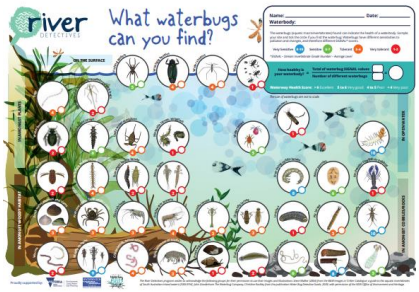
- White ice cube trays (1 or 2 per sorting tray works well)

- White spoons (1 per student). White is best to highlight the bugs although plastic spoons are hard to come by these days and we encourage a planet-friendlier option if possible.

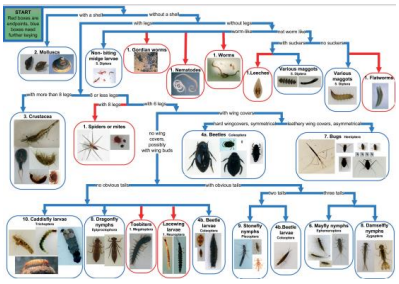
- Pipettes for sucking up small bugs (not essential as spoons will do – they tend to become water pistols with students !) *We do not recommend using tweezers as you might see in some instructional videos.*

- Magnifying glasses / three-way bug viewers from your favourite educational supplier. You could also invest in traditional microscopes, USB microscopes or macro lenses for smartphones / ipads if you want to get fancy. This can help you show bugs on a big screen to the whole class / take macro photos.

- Waterbug identification charts/guides, 1 per tray choosing from;
    - Simple ID chart printed at A3 size and laminated (suitable for all but particularly early childhood, primary)



    - Simple key chart printed at A3 size and laminated (suitable for upper primary and secondary students)

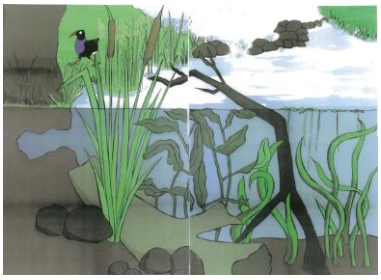


Other *optional* waterbug identification tools;

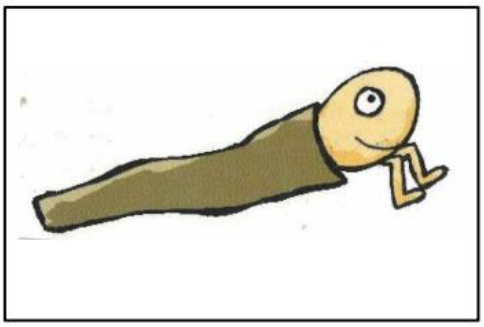
- Advanced key booklet printed (suitable for upper secondary students and adults)
- The Waterbug App (free for your device) to use in the classroom or out in the field for keying out species digitally
- Interactive Waterbug flip chart on the River Detectives website (not all species featured).

- Waterbug data sheet (1 per student or sampling tray group) for recording bugs, calculating your score and rating the health of your waterway OR data can be put straight into the River Detectives online portal (login required).
  Note: You don't have to record what you find. You can just start by exploring and build up to identification, recording and entering your data on the portal.

- To introduce your waterbug session we highly recommend using the in-stream habitat poster. Head to the waterbug topic of Resource Riverbank to colour print each quarter of the poster at A3 size, laminate, trim and stick together to form an A1 poster. This will help students visualise the habitat zones within a waterway.



- The waterbug fact cards can be used to introduce key bugs and placed on the poster in their likely habitat to tune students in to what they might find in their sample. The waterbug cards can be printed and laminated back to back. Other uses for the cards are included in the waterbug card document.



I am a CADDISFLY LARVAE

I am found in the ***Reed Zone*** and ***Substrate Zone*** amongst rocks, branches and plants. I am **very sensitive** to poor water quality.

I can be a **detrivore** or **omnivore** eating plant material, fine organic matter and invertebrates.

I build myself a protective case out of leaves, sand, reeds or sticks and drag it around.

- You may also want to purchase a large plastic tub for housing the equipment at your school.

For all other support in running a sampling sessions with students, collecting a sample, teaching/learning about waterbugs, identifying bugs see the publicly accessible Resource River Bank tab (Waterbug topic) of the River Detectives website www.riverdetectives.net.au There are fact sheets, videos, activity sheets, etc for all age groups.

Extra special resources for registered users only;

- 'The Secret Life of Waterbugs webinar' can be found at the Let's Test and Record tab (login required).

- Ask the Expert webinar, 'Wild About Waterbugs' with freshwater ecologist and waterbug guru John Gooderham can be found at the Diver Deeper tab (login required) or publicly on youtube.

- A wonderful matrix of cross-curricular, multi-age waterbug activities can be found in the Dive Deeper tab (login required).

River Detectives at a Distance

Theme: Macroinvertebrates

Objective: To appreciate macroinvertebrates for their incredible adaptions, as valuable indicators of waterway health and the building blocks of the aquatic food chain.

The very best way to immerse yourself in the world of waterbugs is to carry out bug sampling. It's awesome fun and we hope that you will be able to experience it at school to make this matrix come to life.
SAFETY MESSAGE: Sample collection at waterways can be dangerous and must only be done by an adult or with adult supervision and AT NO TIME MUST ANYONE ENTER THE WATER OR SAMPLE ALONE.

Ways to be Smart	Knowing	Understanding	Applying	Analysing	Creating	Evaluating
Word Smart I learn best by reading, writing & speaking	Research the meanings of the terms 'macro' and 'invertebrate' to define 'macroinvertebrates'. Bugs help us assess water quality as they can be 'sensitive' or 'tolerant'. What do those terms mean ?	Research the meaning of the terms 'nymph' and 'larvae'. Highlight the bugs on the data sheet that belong to these two groups. I wonder what the bugs looks like and where they live when they grow up ? Investigate their life cycle.	Use the waterbug fact sheets or waterbug flip chart to research a chosen creature. Gather data/images about its name, appearance, habitat, diet, life cycle, movement, sensitivity and adaptions.	Watch the Water Spider V Water Strider video then consider who would win from two other chosen waterbugs. Represent the battle by writing and illustrating a comic strip or film storyboard. Analyse the features that gave bugs their edge.	Present the findings from your waterbug research (left two boxes) in a chosen format; design a poster, make a slide show, film a video, write a non-fiction book or be creative and come up with your own idea.	Macroinvertebrates may be tiny, but many people argue they are the most important creatures in an aquatic ecosystem. What do you think? Write a persuasive piece of text to justify your opinion.
Number Smart I learn best by working with numbers/science	From your own knowledge or research compile a list/table of aquatic macroinvertebrates, terrestrial macroinvertebrates, aquatic vertebrates and terrestrial vertebrates OR see below	Waterbugs have some very cool adaptions to help them hunt and avoid being hunted. Check out these videos to learn how water striders walk on water or how beetles breathe under water.	Check out the macroinvertebrate data sheet to learn about the bugs in each sensitivity category and the numerical score attributed to bugs. Practise using it by filling it out with mock survey results.	Use the formula on the data sheet after sampling (see Body Smart) to calculate the score and assess the health of your waterway. Upload your data to the River Detectives website (class login required)	Dive deeper to investigate the science of water tension. Watch this video and try the experiment then go wild and try seven other amazing surface tension science experiments.	Design a food chain showing the role waterbugs play in the wider web of flora and fauna. Speculate the impact of various scenarios ie. high phosphorus, zero in stream vegetation, stock excluded, drought. What could happen ?
Picture Smart I learn best by drawing and visualising	From your own knowledge or research draw/source pictures of aquatic macroinvertebrates, terrestrial macroinvertebrates, aquatic vertebrates and terrestrial vertebrates OR see above.	We know that macroinvertebrates live in water but did you know there are actually five habitats within freshwater environments ? Read pg 6-7 of this waterbug guide to learn more and then do the activity below.	Use your handmade net (below) or any net with very fine mesh to scoop a water sample from the banks of a freshwater creek, lake, dam, river or wetland and use this sheet to draw the life you observe.	Use your observations, waterbug fact sheets or the waterbug flip chart to create a scientific waterbug sketch. Label all body parts and any cool adaptions your bug might possess. Pages 8-9 of this booklet explain mouthpart types.	Watch a video about taking great bug phone photos and give it a try. Submit photos in The Waterbug App whilst sampling or post photos of unknown creatures on the Waterbug Face facebook page for help with identification by experts.	Use what you know about waterbug physiology, adaptions, behaviour, habitat and diet to design your own 'invincible macro'. Sketch and label it, make a collage or construct one from disused boxes and containers.
Body Smart I learn best by being active and hands on	Make your own bug dial to learn about bugs, the way they move, their tolerance, where they live and special features.	Print out the 'All About Waterbugs' cards (picture only). Now print out or draw your own instream habitat poster and use the habitat information with the cards to blue tac the bug pictures in their preferred habitat zone.	Use these instructions to make your own sweep net for waterbug sampling. *Please note kick nets are used whilst standing in shallow water and we do not recommend this method for volunteers. Make the scoop net only.*	Watch the three-week development of a window sill pond ecosystem; week 1, week 2 and week 3 then make your own and see what you discover. Journal your findings – see two rows below	Watch this video then have a go at waterbug sampling (preferably with your class). Depending on your age you can use a simple i.d chart, a simple key, an advanced key or even the Waterbug App. Record findings on a data sheet.	Conduct class waterbug sampling (see left) at sites along your adopted waterway, at different waterways and at different times of the year and compare and contrast changes in bug diversity and abundance.
People Smart I learn best by working with others	Complete a mind map with friends or family to record everything you collectively know about waterbugs and what you'd like to know about waterbugs. Update the mind map as you complete this matrix to track your learning.	Prepare another copy of the cards as above. Use the two sets to play Concentration or Snap. Make it more challenging; cut out the fact cards and play Concentration again with a set of pictures and facts and match them.	Use your double set of 'All About Waterbugs' cards to play Fish to practise your identification skills. Use a single set to play Celebrity Head testing the knowledge of all players with insightful questions and factual answers.	Use one set of 'All About Waterbugs' cards and sort them into groups; herbivores/carnivores, legs/no legs, habitat zones, sensitive/tolerant. How else could you classify them ?	Waterbug sampling is such a fun and simple thing to do but many have never had the opportunity. Run a session with your family, grandparents or friends. Reflect on how they react, what they learn and what you teach them.	Use what you've learnt about the amazing adaptions that some waterbugs have developed to survive and thrive. Conduct a debate with others and present evidence to justify why your chosen bug is the coolest bug.
Self Smart I learn best by myself	Watch this video for a fantastic introduction to waterbugs and why they are so important. Add your new knowledge to the mind map above and any questions it has generated for you.	Download the free Waterbug App and start browsing to explore the world of macroinvertebrates. Check out the photo gallery, read about bugs or browse the key/silhouettes that will assist you to identify a bug.	Keep a journal of sketches and notes to record the life you discover and the changes you observe in your window sill pond ecosystem above) Try it in other seasons – is there a difference ?	Watch this video that links water quality and waterbugs. From your experience as a River Detective doing water quality monitoring, what changes (other than pollution and micro plastics) might waterbugs be sensitive to ?	Chill out, put some relaxing music on and have some mindful 'me time' completing one of the beautiful waterbug colouring sheets (scroll down at this link to find a variety to choose from)	Evaluate the data from water quality tests at waterways across the state and use your knowledge of water quality parameters to identify waterways you'd expect to support a high / low diversity and abundance of bugs.

To borrow macroinvertebrate sampling equipment get in touch with your regional River Detectives coordinator. Please adhere to all current COVID-19 advice in remote learning and school-based settings.
Send your efforts to your teacher and it may be shared in the school newsletter or on the Billabong Banter tab of www.riverdetectives.net.au Make sure you have permission from parents first.