



# Water Bug Watch

**K-5 In-School Version**

ACT Waterwatch  
By Tanya Rucosky Noakes

## **ACT Essential Learning Achievement Links:**

### **Student uses a range of strategies to think and learn:**

#### *Early Childhood*

- ◆ Uses pictures and diagrams to help thinking
- ◆ Uses appropriate thinking tools and processes or strategies
- ◆ Uses vocabulary of the thinking tools, processes or strategies
- ◆ Understands the importance of thinking and talking about their thinking and learning

#### *Later Childhood*

- ◆ Uses broad steps to undertake a straightforward analysis
- ◆ Uses simple logic
- ◆ Understands how visual representations can assist thinking
- ◆ Harnesses imagination to solve problems
- ◆ Orders and sequences their ideas
- ◆ Reflects on and discusses aspect of their thinking processes as they deal with a problem
- ◆ Values and seeks help when needed
- ◆ Values explicit thinking skills
- ◆ Values imagination as a thinking skill

### **Student understands and applies the inquiry process**

#### *Early Childhood*

- ◆ Understands inquiry as a process for creating new information
- ◆ Sees inquiry as a useful process available to them
- ◆ Uses the inquiry process in authentic situations
- ◆ Engages with their world by asking questions about familiar situations
- ◆ Makes predictions and conjectures based on their everyday experience and thinks though ways to test them
- ◆ Plan and carry out investigations that are related to their questions, conjectures and predictions which involve several steps
- ◆ Makes observations about what is happening around them using their senses
- ◆ Gathers information or data from a small range of sources
- ◆ Attempt to convince themselves and others about whether their findings were accurate
- ◆ Share and communicate observations, results, ideas and understandings.

#### *Later Childhood*

- ◆ Discuss and compare the results of the investigation with their predictions, offer and explain conclusions and communicate ideas and understandings
- ◆ Maintains and strengthens their curiosity

### **Student makes considered decisions**

#### *Early Childhood*

- ◆ Understand the implications of having a choice
- ◆ Values the delay of self-gratification
- ◆ Is aware when they have a choice
- ◆ Delay a decision until they have thought about it
- ◆ Identify criterion of making a good decisions
- ◆ Change their plans if they have a new idea or gain new information
- ◆ Make decisions and put them into effect in authentic situations

#### *Late Childhood*

- ◆ Knows what an option is
- ◆ Lists advantages and disadvantages and risks of various options using the inquiry

process to gather information

- ◆ Identify possible consequences of different decisions
- ◆ Make decisions and put them into effect in authentic situations

### **Student understands and applies scientific knowledge**

#### *Early childhood*

- ◆ Living and non-living things and their identifications and description according to features, characteristics and properties
- ◆ Change in the physical and natural world
- ◆ Distinguish between living and non-living things
- ◆ Observe structural features in animals
- ◆ Observe how living things change as they grow
- ◆ Evaluate ways in which living things are effected by their environment and how they impact on it and other living things
- ◆ Observe, explore identify and describe natural phenomenon
- ◆ Value curiosity in exploring the physical and natural world

#### *Later Childhood*

- ◆ Understand features and characteristics, properties and classifications of natural phenomenon
- ◆ How and why change occurs in the physical and natural world
- ◆ Interdependence of living things on each other and their environment
- ◆ Application of scientific knowledge to their own lives
- ◆ Structure and function of systems that enable living things to survive
- ◆ Grouping living things using observable characteristics
- ◆ Different environments support different living things
- ◆ Interactions between living things, and between living things and their environment
- ◆ Life cycles and reproductive processes of different types of living things
- ◆ Observe, explore, identify, describe compare , order and classify natural phenomenon.
- ◆ Understand ethical issues in science related contexts
- ◆ Carefully and safely handles living things

### **Students acts for an environmentally sustainable future:**

#### *Early Childhood:*

- ◆ Understands how humans and other living things depend on the environment around them for essential elements they need for survival
- ◆ Understands how their local environment changes over time
- ◆ Understands the connections between their own actions and environmentally friendly strategies
- ◆ Identify parts of familiar environments and describe some simple relationships
- ◆ Value the scope and beauty of the natural world
- ◆ Feel responsibility within their community for the quality of their immediate environment and resource conservation
- ◆ Understand the importance of conserving resources, protecting the environment and participating in positive environmental education

#### *Later Childhood*

- ◆ Understand systems in the natural environment and how changes in elements of them affect the system as a whole
- ◆ Understand elements that make up significant local, national, and global natural and built environments and the ways in which the features of these environments are connected
- ◆ Understand the effects of change on local national and global natural environments
- ◆ Understand the need for and ways to conserve finite natural resources

- ◆ Understand care of places and the values held by involved individuals, and groups, including indigenous groups
- ◆ Observe, record and make inferences about small local ecosystems
- ◆ Reflect on ecological issues and form a view on them
- ◆ Understand how the actions of communities and individuals, including their own, contribute to the sustainability of resources and local environments and shape the future for future generations

**Student creates artistic works**

*Early Childhood*

- ◆ Understands how qualities such as colour, thickness, length, and density can assist them to depict things in painting and drawing

*Later Childhood*

- ◆ Understands how to use different materials, techniques, skills and processes to make 2D and 3D artistic works

## Bibliographic and Supplement Information Sources

- Identification and Ecology of Australian Freshwater Invertebrates* <http://www.mdfrc.org.au/bugguide/index.htm>
- Stream Bio-monitoring Unit Key to Aquatic Macro-invertebrates* <http://www.dec.state.ny.us/website/dow/stream/orderpageone.htm>
- Stream Health and the Aquatic Macro-invertebrate Long Term Ecological Monitoring Program* [http://www.nps.gov/applications/nature/documents/stream\\_aquatic\\_macro.pdf](http://www.nps.gov/applications/nature/documents/stream_aquatic_macro.pdf)
- Indicator: Aquatic Macro-invertebrates in the ACT* <http://www.environmentcommissioner.act.gov.au/SoE/SoE2000/ACT/Indicatorresults/Aquaticmacro-invertebrates.htm>
- The Stream Study* <http://www.people.virginia.edu/~sos-iwla/Stream-Study/StreamStudyHomePage/StreamStudy.HTML>
- Are We Sustaining Australia?* <http://www.deh.gov.au/esd/national/indicators/report/value20.html>
- Australian Aquatic Invertebrates* <http://www.lucidcentral.com/keys/lwrrdc/public/Aquatics/>
- NSW Water Bug Survey* [http://www.waterwatch.nsw.gov.au/08\\_bug\\_survey/index.html](http://www.waterwatch.nsw.gov.au/08_bug_survey/index.html)
- Aquatic Macroinvertebrate Resources* [http://www.bgsd.k12.wa.us/hml/jr\\_cam/macros/resources.html](http://www.bgsd.k12.wa.us/hml/jr_cam/macros/resources.html)
- Meet the Invertebrates* <http://www.watersheds.org/nature/macrovinv.htm>
- Waterwatch Australia* <http://www.waterwatch.org.au/index.html>
- Sidman, J. (2005) *Song of the Water Boatman & Other Poems*
- Silver, D. (1994) *One Small Square Pond*
- Bugasaurus Explorus* <http://www.bugsurvey.nsw.gov.au/>
- Signal 2 Scoring System for Macroinvertebrates* <http://www.environment.gov.au/water/publications/environmental/rivers/nrhp/pubs/signal.pdf>
- Chessman B. 2001, SIGNAL 2, *A Scoring System for Macro-invertebrates (Waterbugs) in Australian Rivers, User Manual*. Version 2, 2001.
- CSIRO, 1991, *The Insects of Australia*, second edition, Melbourne University Press, Carlton.
- Davis J. and Christidis, F. 1997, *A Guide to Wetland Invertebrates of Southwestern Australia*, Western Australian Museum.
- Gooderum J. and Tsyrlin E. 2002 *The Waterbug Book, A Guide to the Freshwater Macro-invertebrates of Temperate Australia*. CSIRO Publishing, Collingwood Vic.
- Harvey, M. S. and Yen, A. L. 1989, *Worms to Wasps, An illustrated Guide to Australia's Terrestrial Invertebrates*, Oxford University Press, Melbourne.
- Hawking, J.H. and Smith F.J., 1997, *Colour Guide to Invertebrates of Australian Inland Waters*, Cooperative Research Centre for Freshwater Ecology, Identification Guide No 8, Albury.
- Hawking, J.H. 1994, *A Preliminary Guide to Keys and Zoological Information to Identify Invertebrates From Australian Freshwaters*, Co-operative Research Centre for Freshwater Ecology.
- Ingram B. A. , Hawking, J. H. and Shiel R.J. 1997 *Aquatic Life in Freshwater Ponds*, Co-operative Research Centre for Freshwater Ecology, Albury.
- Miller R., 1983, *Freshwater Invertebrates*, Gould League of Victoria. This is a helpful beginners guide to identification.

Williams, W.D. 1980, *Australian Freshwater Life*, Macmillan, Melbourne.

Zborowski, P. and Storey, R. 1995, *A Field Guide to Insects in Australia*, Reed Books Chatswood, NSW.

Basin Kids Home <http://kids.mdbc.gov.au>

Bugasaurus Explorus [www.bugsurvey.nsw.gov.au](http://www.bugsurvey.nsw.gov.au)

Buglopedia! [www.bugsurvey.nsw.gov.au/html/buglopedia.html](http://www.bugsurvey.nsw.gov.au/html/buglopedia.html)

New Zealand Freshwater Sciences Society <http://limsoc.rsnz.org/publications.htm>

Brisbane Insects and spiders home page [www.brisbaneinsect.com/pchew\\_brisbane/index.html](http://www.brisbaneinsect.com/pchew_brisbane/index.html)

CSIRO Entomology [www.ento.csiro.au/aicn/name\\_c/a\\_1264.htm](http://www.ento.csiro.au/aicn/name_c/a_1264.htm)

Australian Insects <http://australian-insects.com/gallery.php>

Wildlife of Sydney [www.faanet.gov.au/wos/](http://www.faanet.gov.au/wos/)

Australian Museum Fact sheets [www.amonline.net.au/factSheets/#insects](http://www.amonline.net.au/factSheets/#insects)

Gould Group <http://www.gould.edu.au>

**Objectives:**

Students will describe the meaning indicated by the diversity of macro-invertebrates

Students will define vocabulary

Students will use macro invertebrates to investigate the health of their catchments

Students will identify macro-invertebrates and describe what their presence indicates

Students will discuss threats to water quality in their catchments

Students will create a poster (in class) or discuss (in field) ways humans can improve water quality in their catchments

**Duration:** 1 hour

**Materials:**

Ice cube containers

Pipettes

Spoons

Tweezers

Paper

Crayons/markers/colour pencils

2-3 samples of macro invertebrates, ideally from 2 –3 separate sites in labelled cat trays

“Art Box” containing various craft supplies

Macroinvertebrate ID sheets

Magnifying glasses/bug boxes

**Vocabulary**

Macro invertebrate

Gill

Larvae

Sensitivity

Pollution

Water quality

Nymph

Adaptation

**Suggested Pre-Activity**

Read: *Song of the Water Boatman* (available from your Waterwatch coordinator)

Put up: ‘*Bidgee Bugs Poster*’ (available from your Waterwatch coordinator)

**Procedure:**

Divide students into groups of 4-6

**Intro: (5 minutes)**

What is Waterwatch.

Ask students why monitoring might be important.

Tell students these insects talk to you. Ask them to take the time to get to know them and learn what they are saying.

Ask students to attempt to define macro-invertebrate and express their importance to the ecosystems in which they live.

Challenge students to explain why monitoring bugs is important as well as chemical

parameters.

Work with students to set macro-invertebrate handling rules.

Identify different micro habitats with in stream area, such as riffles, pools and weedy edges.

Challenge students to theorize on the sorts of animals that might live in each area.

How might they be adapted to their environment?

*Write theories down to revisit after investigations*

Discuss ways that macro-invertebrates can be affected by human and nonhuman events in the catchment

### **Investigation: (20 minutes)**

Instruct students to each capture 1 creature: (this could be an entry for their Water Watch Journals)

Draw it,

Identify it,

Identify it's habitat,

Indicate sensitivity to pollution

Indicate its adaptations to its habitat

Label which sample tray it came from

### **Discussion:(10 minutes)**

Ask students to present their macro invertebrate.

List creatures discovered and sensitivity to pollution for each sample tray

Challenge students to make judgements about the water quality of each sample based on their discoveries

Ask students to extrapolate from their water quality assessments to the source of the samples

Ex: "a farm dam, " a mountain stream" "an urban waterway"

### **Broadening:(15 minutes)**

Form students into groups of 2-4 individuals. Give each group a "Habitat" "Food" and "Protection" card from the Macro-Modelling Deck

Challenge them to use materials from the "Art Box" to create a macro-invertebrate that fits their cards

Invite groups to tell about their creations, the parameters they were asked to meet and allow the class to vote on it's success or lack there of

### **Wrap Up:**

Ask students how humans might affect the water quality of their catchments

Challenge students to think of ways they themselves could improve aquatic habitats.

### **Extensions:**

#### **The Macro Movie:**

Have students write and produce a film/play starring the adventures of several macro-invertebrates. (techniques could involve costumed children, or even stop-action 'claymation')

#### **Our Patch**

Students take on the macro-invertebrate monitoring of water quality at a local body of water

(contact Waterwatch for training and assistance locating an acceptable site)

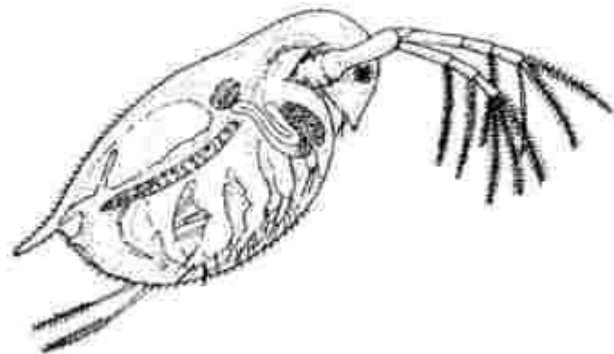
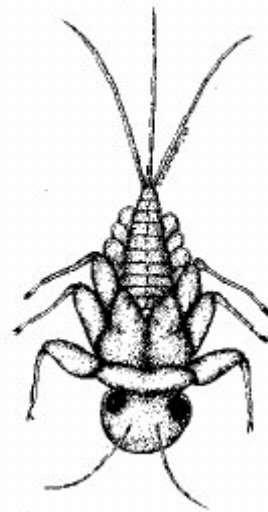
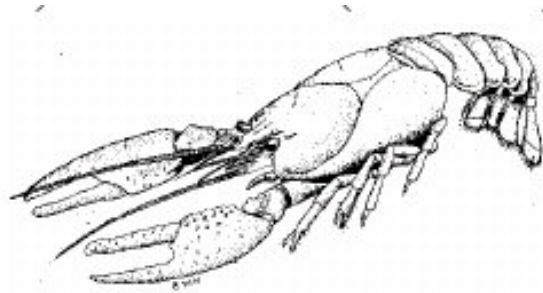
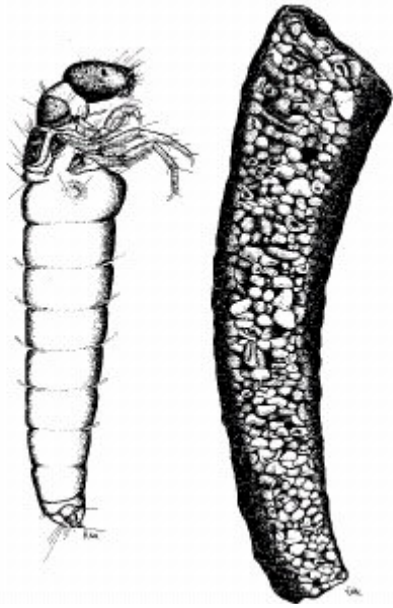
### **Macro Media**

Students create and display posters to explain the importance and role of macro-invertebrates in the catchment.

## Water Bug Worksheet

Follow the directions carefully!

1. Colour **BROWN** the very pollution tolerant animal **BROWN**
2. Colour the very pollution sensitive animal **GREEN**
3. Colour the caddis fly larvae **YELLOW**
4. Colour the arachnid **RED**
5. Colour the crustacean **BLUE**
6. Colour the animal which lives only in ponds **PURPLE**



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