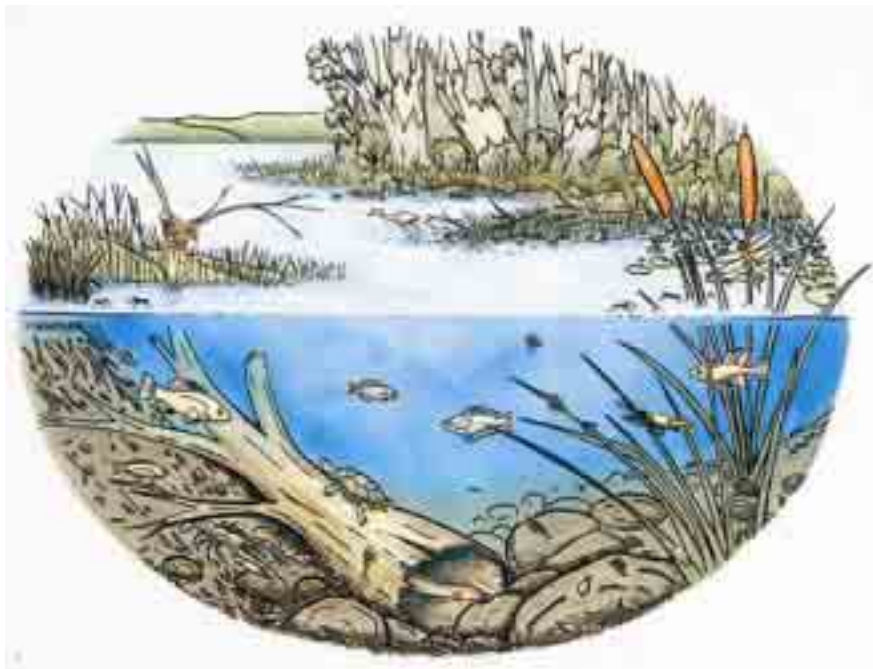




Water bug and riparian vegetation snapshot

Part A



Natural Heritage Trust
Helping Communities Helping Australia



Queensland Government
Natural Resources and Water



Acknowledgements

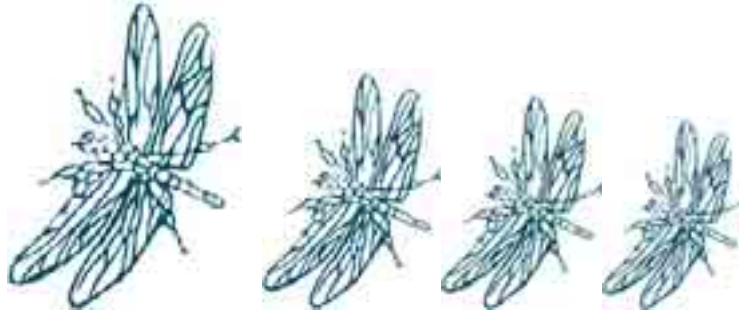
The information within this booklet has been adapted for Queensland by Christina Dwyer and Barry Kenway. Last updated by Kirstin Kenyon in 2003 and Amber Perry and Gabrielle van Willigen in 2007.

Special thanks to the Aquatic Ecosystem Group, Resource Processes, Department of Natural Resources and Water (formerly Department of Natural Resources and Mines), Queensland - especially Chris Thomson.

Please note that ranges for scoring in the Aquatic Macroinvertebrate Results Sheets are based on scores for sites considered to be in good condition within Queensland.

Thank you to Waterwatch SA for allowing Waterwatch QLD to use the Critter Catalogue, compiled by Sarah Farrelly and updated by Emma Nicholson in SA.

Graphics also sourced from Morin, A and Houseman, *Biodidac*, University of Ottawa, <http://biodidac.bio.uottawa.ca/>, last updated 20/3/00.



What is Waterwatch?

Waterwatch is a national initiative to involve and empower communities in the sustainable use and management of catchments. The Waterwatch vision is for healthy catchments and waterways.

Waterwatch aims to increase community awareness and understanding of waterway issues and enhance communities' contribution to natural resource management. This is achieved through community involvement in waterway monitoring and other water education activities.

Community waterway monitoring (Waterwatch) activities are currently underway in most regions of Queensland, through support from regional natural resource management bodies and other organisations.

Those involved include landholders, community groups, industry groups, indigenous groups and schools; working in partnership with local councils, water authorities, regional natural resource management bodies, government agencies and scientific research institutes.

Waterwatch is supported at the state level by the Department of Natural Resources and Water and the national level by the Department of Environment, Water, Heritage and the Arts. These organisations provide strategic and technical support to Waterwatch activities across Queensland.

Waterwatch activities can involve groups monitoring their local waterways using:

- *Biological assessments*, which include looking at animals that live in and around the waterways (for example, 'waterbugs');
- *Stream condition and habitat assessments*, which can involve looking at the plants that live in and around the waterway and how stable the stream banks are; and
- *Chemical tests*, including temperature, salinity, pH, turbidity, dissolved oxygen, nitrogen and phosphorus.

The results of these tests give an indication of the health of the waterway. The tests can be easy to do using methods specifically designed for Waterwatch groups, such as those in this booklet.

Many other resources are available for Waterwatch activities - check out the Waterwatch Queensland website, www.qld.waterwatch.org.au for more details. The *Queensland community waterway monitoring manual* is a good resource for groups looking for more detailed information on biological, stream condition and habitat and physico-chemical monitoring. It includes more advanced sampling methods that align with government monitoring programs.



Important Information for all Waterwatchers!



Waterwatch Safety

- Always let someone know where you are Waterwatching and how long you will be.
- Don't Waterwatch alone. Young Waterwatchers should be accompanied by an adult.
- Wear appropriate clothing and sturdy footwear.
- It is wise to wear gloves when sampling. Even if the stream looks clean, it may not be.
- Take fresh drinking water with you – don't drink the stream water.
- Choose a sampling site that has safe and easy access.
- Do not sample in areas which look heavily polluted or have algal outbreaks.

The *Health and Safety Guidelines for Community-based Waterway Monitoring*, available through the Waterwatch Queensland website, provide further information on how to ensure the safety of community groups and schools when doing water monitoring.

The following pages contain information about waterbugs, where to find the best places to collect macroinvertebrates, what you need for successful sampling and a set of beginner's techniques for sampling and sorting. By taking the time to read these instructions you will increase your chances of collecting a greater diversity of macroinvertebrates.

Background Information about Waterbugs and Riparian Vegetation

What is a 'Waterbug'?

Within Queensland there is a huge diversity of organisms that live together in our waterways. One type of organism is the **macroinvertebrate** or '**waterbug**'. An aquatic macroinvertebrate is an animal without a backbone, that spends all or part of its life in water ie: streams, rivers, ponds, estuaries, wetlands, drains and lakes.

There are many kinds of macroinvertebrates in our waterways. They include worms, snails, mites, bugs, beetles, dragonflies and yabbies. Some of these, like mites, are very small, less than a millimetre in length. Others, like dobsonflies, can grow to over 7cm in length.

Why Study Waterbugs?

Scientists consider waterbugs an excellent '**bioindicator**' of water health. A bioindicator is a biological parameter (eg: fish, plants, frogs and waterbugs) that can 'indicate' your stream's health. Chemical parameters (eg: pH, nutrients, salinity, temperature etc) can also be measured to determine waterway health, however these are often more difficult to assess.

Waterbugs vary in their sensitivity to changes in their environment and while some bugs can survive as the water quality deteriorates, others will not. For example, Mayfly larvae will only live in water with minimal pollution so if you find this type of waterbug, your waterway is more likely to be in good condition. Consequently, by studying the **type**, **number** and **variety** of waterbugs found in your stream, you can work out if your waterway is of poor, moderate or good health.

Where do Waterbugs live?

Different animals can be found in different parts of the waterway. Animals choose their homes for camouflage, protection and a food source .

We can broadly categorise aquatic habitats as moving water (rivers, creeks and streams) or still water (wetlands, backwaters, lakes, dams and pools). Moving water can contain different habitats. Listed below are the four main types of habitat you may find at your site:

- *Edge habitats* - the edges and water surface including overhanging vegetation from the banks. Edge means that there is a definite change from the stream to the bank.
- *Rocky and sandy pools* - pools are deeper areas where the water is still or has slower flows. The bottom of these can consist of mud, silt, sand, gravel, rocks, boulders etc.
- *Macrophytes or aquatic plants* - plants growing in the water.
- *Riffles* - are shallow, rocky sections of rivers with fast flow (warning take care here as algae on rocks often make these spots very slippery).

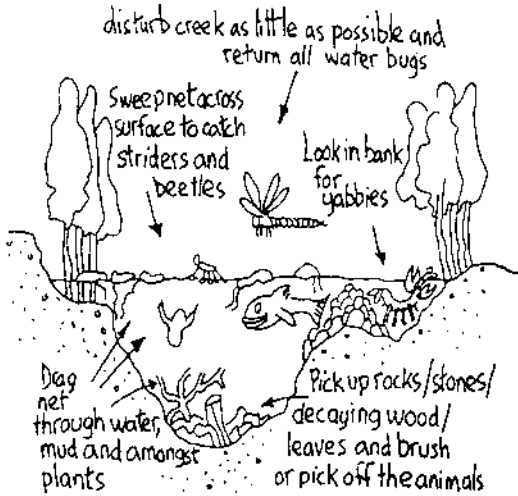
It is a good idea to sample each type of habitat present at your stream site.

See the diagram below for more information.

Where do macroinvertebrates live?

A pre-excursion research activity will help your students to know where to look for aquatic macroinvertebrates.

- * *Each student or group researches the habitat requirements for one invertebrate.*
- * *Enlarge this stream profile and glue onto a big sheet of paper.*
- * *Students collate their findings and locate habitats on the diagram.*
- * *Display the habitat diagram.*



What is a Riparian Zone?

The **riparian zone** refers to the zone directly adjoining a waterway. It includes **bank vegetation**, which covers the bank, and verge vegetation, the strip of land up to 30 metres (for the purposes of this assessment) from the waterway channel. The land beyond this is considered to be the surrounding land use area.

What is surveyed and what might it tell us about stream health?

A riparian vegetation/habitat survey involves looking at the vegetation along the stream and the condition of the banks and stream-bed.

The condition of the vegetation in and around a stream provides a good indication of the likely conditions of the aquatic environment. Stream-side vegetation, if it remains intact, makes a good natural buffer against erosion, controls water temperature, assists with the transport of sediment into streams and wetlands and provides habitat for local fauna species. When the stream-side vegetation is degraded it provides less protection against land use impacts and the subsequent deterioration of water quality and of conditions for aquatic plants and animals.

What equipment do you need?

- The attached Bug Identification Book (Part B) and Recording Sheets (Part C and Part D)
- The riparian vegetation/habitat survey and recording sheet.
- A large fine mesh net - preferably with a long straight side that can be placed across the stream bed (or see instructions on how to make your own stocking net).
- A large pale coloured or white tray to sort through the samples collected
- Tweezers
- Plastic pipette – can be cut by one quarter to increase size of hole
- Small paintbrush for gently brushing small bugs from your net.
- Magnifying glass or hands-lens (most of the bugs are very tiny, so look closely!)
- A white ice-cube tray to hold sorted bugs.
- Gumboots, hat, bucket and camera.

How are the surveys done?

1. Riparian Vegetation/Habitat Survey

1) Make a drawing of your site. Draw any significant details (trees, logs, water plants, rocks etc), and note any visible pollution.

2) Make a quick visual assessment of the stream (banks and bed) by asking yourself the following questions.

- a) Are there a variety of stream habitats? (riffle, rocky pool, sandy pool, macrophytes and edge habitats).
- b) Is there evidence of erosion of the banks?
- c) What kind of vegetation can you see along the stream bank?
- d) What proportion of the stream bank vegetation is made up of native species?
- e) Note any obvious pollutants eg: bottles, car bodies, plastics, animal carcasses, a slick or film over the surface etc.

3) Undertake the riparian vegetation/habitat survey using the guide in this booklet.

4) Keep a visual record using photographs.

'A picture is worth a thousand words'. Taking photographs of your survey site provides an excellent visual record. If you wish to use the site again you have an exact record of how a stream changes.

'Before' and 'after' pictures are very valuable in depicting stream alteration. Some streams will change more dramatically than others. Suggested photographs are:

- from the bank looking upstream (include vegetation)
- from the bank looking downstream (include vegetation)



- a bend in the stream
- from a distance, overlooking the creek and surrounding areas - from an elevated position.

5) Record your assessment of the site from poor to excellent on the recording sheet provided in the appendix.

A stream with a wide variety of habitats, little bank erosion and a riparian zone of trees (preferably with some understorey of shrubs and or grass) that are native species, is likely to support the greatest biodiversity in terms of aquatic macroinvertebrates, fish, turtles and so on.



Waterbug Survey

2. Sampling of Waterbugs

1. To collect a sample of waterbugs start downstream and work upwards, as the flow will carry the animals and material into your net. If there is not enough flow to wash invertebrates into your net, sweep it through the water as you walk upstream. Take care when sampling because there may be rapid flow in some sections, deep pools in the waterway, or unstable banks.
2. Use the net to collect a sample of waterbugs from your local stream or waterway. Sweep the net for 5 minutes through the different aquatic habitats present at your site.
3. If you are sampling amongst water plants, beat gently and scrape your net against the base of the plants to dislodge any invertebrates clinging to the surface.
4. If you are sampling in the sediment, shuffle and kick the ground vigorously with your boots to stir up the dirt, debris and material.
5. Remember to turn over and scrub rocks and logs in the water; these provide homes for many animals. Be careful when moving rocks.
6. NOTE: It is also useful to sample the habitat types separately and compare your results for each habitat type. This helps to determine the habitat preference for different waterbugs.



3. Sorting

- 1) Place a small amount of water into the white tray and empty the contents of your net into the sorting tray. Do not overfill your trays, instead divide the remaining material between a number of trays. This will enable you to view any macroinvertebrates that are 'hiding'. Wash down the sides of your net with some water to make sure you get your entire sample into the tray. Keep the bugs in a shady spot.
- 2) If there is a lot of mud in your sample, let it settle for about 10 minutes; this will make it easier for you to find the animals.
- 3) Sort the captured bugs on the large white tray into their various types using the pipette, paintbrush and tweezers (be careful not to harm the bugs). Pick and sort through the collected material for at least 20 minutes. Some bugs are great at camouflage and may take time to find.
- 4) Sort different animals into separate sections in the ice cube tray.
- 5) Return all duplicate bugs remaining on the large tray to the stream in a shady location.
- 6) Use the Part B Bug Identification book to identify your bugs. You may need to access some other references to help with your identification. See the reference list at the end of this booklet.



4. Recording

There are two versions of the recording sheet in this bug book. The first (basic) version (Part C) is relatively simple to use and offers interpretation for the general health of the environment at your testing site, based upon the number of different water bugs found (taxa richness) and the total of the pollution sensitivity ratings – this gives a Pollution Index.

The advanced version (Part D) introduces the concept of the SIGNAL Index through a sensitivity score for your testing site. The value derived can be used to interpret the site condition using the matrix. Information about the SIGNAL Index is included below. Use the recording sheet that is most suitable to your needs.

1. Record the findings of your sampling on the relevant Aquatic Invertebrate Record Sheet. If you are sampling at more than one location, photocopy a separate record sheet for each location.
2. Record your location so you can sample the same site in future years. You could also keep your photos with your survey information for future reference.
3. Gently return all bugs to the stream in a shady position.



5. Interpreting your Results

The results sheets within this booklet provide basic interpretative information. The following provides further information about sensitivity scores and the SIGNAL Index. This may be useful, particularly if you are undertaking the *advanced* level task.

Pollution Sensitivity or SIGNAL Index

Although habitat condition can sometimes be the over riding factor in determining macroinvertebrate diversity, the presence or absence of certain species can be directly attributed to water quality. The sensitivity of different groups of macroinvertebrates to water pollution varies. Some species are extremely tolerant of pollution while others are extremely sensitive.

The impact of water pollution on a site can be assessed by determining if animals sensitive to pollution have been lost from the site. A National River Health Program (NRHP) Research and Development Project (Chessman, 1995) developed a methodology for the bioassessment of water pollution, the SIGNAL Index (Stream Invertebrate Grade Number Average Level). The SIGNAL Index has been developed specifically for the macroinvertebrate fauna in Australian rivers.

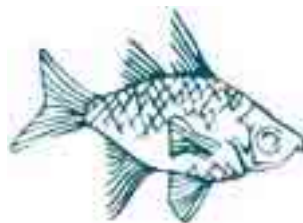
Each family of macroinvertebrate has been allocated a pollution sensitivity grade number based on how sensitive each taxon is to various pollutants. Pollution sensitivity grade numbers range from 1 (most tolerant of pollution) to 10 (most sensitive to pollution). The SIGNAL Index value is calculated simply by averaging the pollution sensitivity grade numbers of the families of macroinvertebrates present at a site. The higher the SIGNAL value, the better the condition of a site.



What can I do with the data?

Here are some ideas on what to do with your data once you have collected it.

- Sample with other schools in the catchment. Take a trip to their site to see the difference in habitat.
- Compare your data with other schools/groups in the catchment. What results did they obtain? What could account for the differences/similarities in your results?
- Compare your data with previous years. Are there any differences in the results? How can these differences be explained? Has there been any improvement in the water quality? Why?
- Graph the number of animals found in each tolerance level (eg: very sensitive, sensitive, tolerant, very tolerant).
- Graph the difference in water quality over time.
- Graph abundance of each family.
- If you have several sites, map the water quality in different locations. How do they compare?
- If you have poor or average water quality, what is causing it? You could undertake some chemical tests to determine any problems. How could you improve the quality? Undertake the survey again next year to see if your actions have improved the macroinvertebrate population.
- Speak to a Waterwatch coordinator or group to get some new ideas on monitoring water quality in your area.
- Give your data to a Regional Waterwatch coordinator for their records – see the Waterwatch Qld website for contact details www.qld.waterwatch.org.au/regions
- Further investigate any animals you could not identify in the field. Try different macroinvertebrate references, CD-Roms or websites.
- Begin a scrapbook or recording book for the sites you have visited, recording photographs of the site and surround habitat (riparian zone). Record your results for the habitat assessment and aquatic macroinvertebrate result. Visit these sites next year and compare the results, seeing if changes take place over time.



References and Resources

Choy, S.C and Thompson, P. (1996). *River bioassessment and monitoring using benthic macroinvertebrate community structure: the Monitoring River Health Initiative*. In: Hunter, H.M., Eyles A.G and Raymont, G.E (eds). *Downstream Effects of Landuse*. Department of Natural Resources, Queensland, Australia, pp.53-55.

CSIRO Entomology (1999), *Interactive Guide to Australian Aquatic Invertebrates*, CD Rom for Windows, Edition 2.

Department of Natural Resources (1997). *Biological monitoring and assessment of freshwaters using macroinvertebrates*, Aquatic Ecosystem Group, Department of Natural Resources and Mines, Rocklea. Ph (07) 3848 1504.

Department of Primary Industries (1994). *Water Quality Sampling Manual*, DPI, Brisbane.

Foster, D. (1994) - *Waterwatch Queensland Technical Manual*, Queensland Department of Primary Industries (Out of Print).

Hawking, John, H. and Smith, Felicity, J. (1997). *Colour Guide to Invertebrates of Australian Inland Waters*, Cooperative Research Centre for Freshwater Ecology.

Tyler, M.J., Twidale, C.R., Ling, J.K. & Holmes, J.W. *Natural History of the South East*.

Morin, A and Houseman, *Biodidac*, University of Ottawa, <http://biodidac.bio.uottawa.ca/>, last updated 20/3/00.

Sainty, G.R and Jacobs, S.W.L (1994). *Waterplants of Australia*, CSIRO Division of Water Resources.

Waterwatch Australia (2002). *Waterwatch Australia Technical Notes*, Environment Australia

Waterwatch South Australia (1997). *Critter Catalogue*, Dept of Environment and Natural Resources.

Williams, W.D. (1980). *Australian Freshwater Life*, 2nd Ed, MacMillan, Melbourne.

Appendices

1. Glossary
2. How to make a stocking dip net
3. Riparian Vegetation/Habitat Survey and Recording Sheets

Record sheets (*Bug ID Record Sheet – Basic*; and *Bug ID Record Sheet - Advanced*) – available as separate PDF documents to download.

1. Glossary

Abdomen	rear-most of the three body divisions of an insect
Anal pyramid	a pyramid structure located around the anus of the dragonfly
Antenna(e)	a pair of jointed sensory organs or feelers on the head
Anterior	head end, forward-facing section
Appendage	any part, piece or organ attached to the body by a joint or other main structure
Aquatic	water dwelling
Beak	the point of a bivalve shell
Benthic	of or pertaining to the bottom of the water
Bivalve	made up of two valves or shells which are hinged together
Burrower	organism that burrows
Carapace	chitinous or bony shield covering part or entire body of crustaceans
Carnivore	flesh-eating
Cerci	jointed appendage(s) at the end of abdomen
Cilia	hair-like outgrowths
Colonial	collection of same species of animals living together
Detritivore	an organism feeding on detritus
Detritus	small pieces of dead and decomposing plants and animals
Dorsal	the upper or top surface
Filter-feeder	an animal that feeds on small organisms by straining from the surrounding water
Grazer/scrapper	consumers of algae and associated material attached to the surface of the submerged plants and rocks
Herbivore	plant-eating
Hydrophobic	repels water

Invertebrate	animal without a spinal column
larva(ae)	early or immature developmental stage of an organism
macrophyte	a term used to describe water plants, either rooted or floating, other than microscopic algae
Mouth hooks	secondary, solid, cuticular, claw-like structures, the substitute jaws of larvae
Nymph	juvenile, sexually immature stage of certain insects, usually similar to the adult form
Omnivore	both flesh and plant eating
Parasite	an animal or plant living on or in another organism from which it derives its food
Piercer	penetrates by piercing mouth parts
Posterior	pertaining to or situated towards the rear end
Predator	consumes living animal tissue
Prehensile	adapted for grasping and holding
Prolegs	unjointed abdominal appendages of some insects
Pupa(e)	transformation stage between larva and adult in the lifecycle of an insect
Respiratory tube	long tube-like apparatus for breathing in Hemiptera and Diptera
Riffle	section of river or stream, generally shallow, with rapid or turbulent flow
Scavenger	feeds on dead organic matter
Scraper	an animal which scrapes food, generally algae, from rocks
Setae	stiff needle-like structures, similar to hair
Shredder	consumes coarse particulate organic matter, for example, wood, leaves, bark
Spiracle	aperture or orifice used for the exchange of respiratory gases
Substrate	the bottom or base or solid structure within the waterbody
Tarsi	feet, the equivalent of the human ankle
Thorax	the portion of the body between the head and the abdomen; the middle of the three segments of an insect

2. How to make a stocking dip net

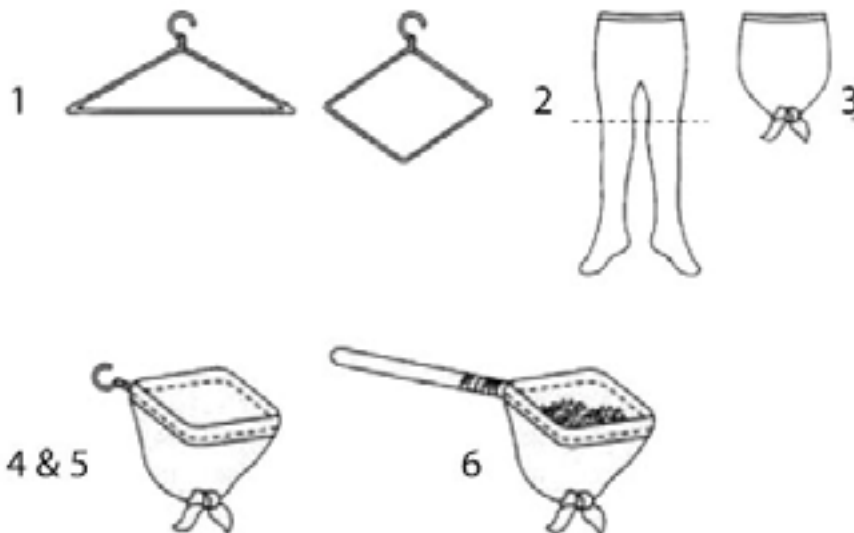
Equipment needed

- wire coat hanger
- needle and thread
- panty-hose
- string or tape
- a stick or rod

Instructions

1. Bend the coat hanger so that it is almost square.
2. Cut the legs off the panty-hose half way.
3. Tie the legs together to form a basket. You may need to trim some more off the legs.
4. Place the panty-hose through the coat hanger and fold the waist band of the panty-hose over the coat hanger to form a hem. It is important to fold the panty-hose so that the hem is outside the net. This will prevent water animals from becoming lodged in the hem.
5. Sew the hem to hold the coat hanger firmly in place.
6. Attach the coat-hanger to the stick or rod using string or tape.

Now that you have made your own dip net, remember to bring it on your field trip!



3. Riparian vegetation/habitat survey and recording sheets

The Steps

- A. Read the information provided for each factor.
- B. Use the field guide ratings to determine a score for each factor.
- C. Record your rankings on the Recording Sheet.
- D. Interpret your results.

A. To assess the health of the riparian vegetation/habitat around the stream you are monitoring, you will need to look at a number of the factors described in this section. For each factor, survey a distance of 100 metres in each direction on both banks (if possible) near your monitoring site.

1. Bank Vegetation

Bank vegetation refers to trees, shrubs, grasses, etc. actually growing on the bank. The canopy is the overhanging tree cover. This vegetation provides food and shelter for aquatic organisms in the form of fallen leaves, twigs, branches, etc.

2. Verge Vegetation

The stream verge is different from the bank. For this stream habitat survey the verge is considered the section of land up to 30 metres from the water's edge. The verge vegetation can be quite extensive but many streams in urban settings have almost no verge vegetation at all.

3. In-stream Cover

Fish and other aquatic organisms require snags, logs and rocks where they can shelter from predators and the current and can reproduce, to help them establish territories and to provide markers that help them navigate. Aquatic plants are also very important for fish and other creatures in the stream; apart from providing food, their presence has a direct effect on the available oxygen in the water, which in turn can affect the type of fish and other animals living in the stream. Protruding snags provide roosting and preening sites for birds.

3. Bank erosion and stability

Streams naturally erode, usually on bends (meanders). However, changes in adjacent land areas can cause a stream to become unstable, resulting in continuous erosion along its channel. Such changes include increased run-off from impervious surfaces and piped tributaries, stock access, or direct interference such as straightening or channelling the stream. If it has been channelled or stabilised with concrete banks, the stream will obviously be stable with little erosion, but should not be ranked highly as it has little or no vegetation cover.

4. Riffles, Pools and Bends

Rocks and debris in the stream may create shallow areas over which the water rushes quickly to form a riffle. This is called a riffle in the stream system. Upstream of a riffle

the water is often quiet and may form a pool. Pools are important in providing deeper areas for fish. Riffles are important for aerating (adding air and therefore oxygen to) the water and providing habitat for many invertebrates.

Streams that have a number of pools and riffles are able to support more life and greater variety of species than those that do not vary in character at all. Larger, slow-flowing rivers may not have riffles, but bends in the river can provide different habitats because the cutting action of the water at bends provides deeper areas and areas of different water speed.

B. Habitat Survey Field Guide Ratings

Excellent	Good	Fair	Poor	Very Poor
Bank Vegetation				
(10) Mainly undisturbed native vegetation. No signs of alteration.	(8) Mainly native vegetation. Little disturbance or no signs of recent site disturbance	(6) Medium cover, mixed native/ introduced. Or one side cleared, the other undisturbed.	(4) Introduced ground cover, little native under or overstory, predominantly introduced vegetation.	(2) Introduced ground cover with lots of bare ground, occasional tree. Also includes sites with concrete lined channels
Verge Vegetation				
(10) Mainly undisturbed native vegetation on both sides of the stream. Verge more than 30m	(8) Well-vegetated wide verge corridor. Mainly undisturbed native vegetation on both sides of stream; some introduced or reduced cover of native vegetation	(6) Wide corridor of mixed native and exotics, or one side cleared and other wide corridor of native vegetation	(4) Very narrow corridor of native or introduced vegetation.	(2) Bare cover or introduced cover such as pasture land.
In Stream cover				
(10) Abundant cover. Frequent snags, logs or boulders with extensive areas of in-stream, aquatic vegetation and overhanging bank.	(8) A good cover of snags. Logs or boulders, with considerable areas of in-stream and overhanging vegetation.	(6) Some snags or boulders present and/or occasional areas of in-stream or overhanging vegetation.	(4) Only slight cover. The stream is largely cleared, with occasional snags and very little in-stream vegetation. Generally no overhanging vegetation.	(2) No cover, no snags, boulders submerged or overhanging vegetation. No undercut banks. Site may have rock or concrete lining.
Bank erosion and Stability				
(5) Stable: no erosion/ sedimentation evident. No undercutting of banks, usually gentle bank slopes, lower banks covered with root mat grasses, reeds or shrubs.	(4) Only spot erosion occurring, little undercutting of bank, good vegetation cover, usually gentle bank slopes, no significant change to bank structure.	(3) Localised erosion evident. A relatively good vegetation cover. No continuous damage to bank structure or vegetation.	(2) Significant active erosion evident especially during high flows. Unstable, excessive areas of bare banks, little vegetation cover.	(1) Extensive or almost continuous erosion. Over 50% of banks have some form of erosion: very unstable with little vegetation cover.
Riffles, pools and bends (flowing water only)				
(5) Wide variety of habitats. Riffles and pools present of varying depths, bends present.	(4) Good variety of habitats – eg: riffles and pools or bends and pools. Variation in depth of riffle and pool.	(3) Some variety of habitat – eg: occasional riffle or bend. Some variation in depth	(2) Only slight variety of habitat. All riffle or pool with only slight variation in depth.	(1) Uniform habitat. Straight stream, all shallow riffle or pool of uniform depth eg: channelled stream or irrigation channel.

This information was largely extracted from the 'Community Water Quality Monitoring Manual for Victoria' (1994). The Habitat Survey technique was adapted from 'The Environmental Condition of Victorian Streams', a Report by Phillip Mitchell for the Department of Water Resources, Victoria (Feb 1990).

